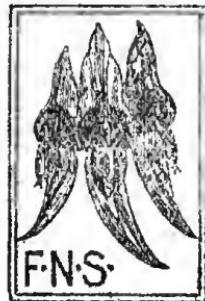


The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide



Nov. 1932

Vol. XIV.

No. 1

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The authors of papers are responsible for the facts recorded and opinions expressed.

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OFFICE-BEARERS, 1932-33.

Chairman: Mr. E. H. ISING.

Vice-Chairmen: Lt. Col. FULTON and Mr. W. A. HARDING.

Secretary: Mr. E. V. DIX.

Assistant Secretary: Mr. L. REYNOLDS.

Treasurer: Mr. BERNARD C. COTTON.

Magazine Secretary: Mr. BERNARD C. COTTON.

Press Correspondent: Mr. E. V. DIX.

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Professor J. B. CLELAND, Miss E. IRELAND, Messrs. F. TRIGG, W. H. SELWAY, H. M. HALE, A. J. MORISON, F. K. GODFREY and Dr. W. CHRISTIE.

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Auditors: Messrs. W. D. REED, F.C.P.A., and W. H. BROADBENT

Co-Editors "South Australian Naturalist": Mr. WM. HAM, F.R.E.S. and Mr. BERNARD C. COTTON.

Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. B. Cotton, the Museum, North Terrace, or with the Secretary, Mr. E. V. Dix, Harbors Board Office, Victoria Square. In the case of Motor Trips, ticket is to be paid for at time of booking.

Held Over.

An article by A. F. James on "The Native Magpie," has to be held over on account of the pressure on our space.

EXCURSIONS and LECTURES.

1933.

- Jan. 30—Motor to Humbug Scrub at 9 a.m.. Fauna of Reserve.
Feb. 4—Tram at 2 p.m. to Mr. Giesler's, Kent Town. Aquatic Life. (Aquarium). Mr. B. Beck.
Feb 18—Train at 1.15 p.m. to Blackwood Experimental Orchard. Fruit Culture. Mr. R. Fowler.
February 21—Conversazione at A.D. Women's Club.

HUMBUG SCRUB TRIP.—Note that cars leave at 9 a.m. and not at 2 p.m. as stated in the programme.

1935

VICTORIA

The

South Australian Naturalist.

FORTY-NINTH ANNUAL REPORT OF THE FIELD
NATURALISTS' SECTION of the ROYAL SOCIETY
of SOUTH AUSTRALIA (Incorporated).

AUGUST, 1932.

VOL. XIV. ADELAIDE, NOVEMBER, 1932. No. 1

The work of the Section has met with considerable success throughout the last twelve months.

MEMBERSHIP.—In January, 1932, the nominal membership of the Section was over 200, but the actual membership was about 160 and still less were financial. At the present time the Treasurer advises that we have about 130 members of whom about 70 are financial.

EXCURSIONS.—A varied and interesting programme of Excursions has been carried out at which the average attendance has been about twenty-five members and friends. We are indebted to those who have led the Excursions from which members have gained much valuable and interesting information. The Municipal Nursery visit was led by Mr. Pelzer and on March 5 the Chairman kindly tendered a reception to members at his home. An enjoyable outing to Mt. Bold with the members of the Institute of Public Administration took place on March 19.

Mr. Godfrey led an excursion to Outer Harbour on March 26 and on April 2, Mr. Bailey gave an interesting afternoon to members in the Classification Ground at the Botanical Gardens.

Lt.-Col. Fulton and Mrs. Fulton very generously entertained members and friends at "Woolley," Glen Osmond. An enjoyable afternoon was spent in the charming grounds of Mr. W. H. Bagot at Aldgate where pines were admired and other beautiful growths were seen in the autumn shades.

On April 25, an all-day outing under Mr. Kimber's guidance at Pt. Willunga revealed many new and interesting specimens to members. Later Mr. Kimber gave a talk on his early experiences at this pretty spot of Pt. Willunga.

The Woollen Mills and Bat Factory inspection at Tweedvale proved of inestimable value to members when, on Saturday, May 21, this trip was undertaken as the guests of the I.P.A.

Mr. C. T. Madigan kindly led an excursion to the well-known Hallett's Cove on June 6. This coastal excursion is always greatly appreciated by members.

Professor J. B. Cleland gave an instructive talk on fungi during an outing to Long Gully on June 25.

The Chairman again led the excursion to Brown Hill Creek on June 9, when the study of eucalypts was made by members and friends.

Cuttlefish and Shells was the subject of Mr. B. C. Cotton's chat to members during a walk along the beach between Sea-cliff and Glenelg on June 23. Kingston Park, Marino, was also on the programme with Mr. Hogan as leader.

Lectures and evening meetings were features of the year's programme, and the evening of March 15 was very enjoyably spent at the Maple Leaf Cafe, the evening taking the form of a "Conversazione," when various members gave talks and exhibited specimens. The main speaker was Mr. Charles Barrett of the Victorian Field Naturalists.

Natural History Notes was the subject of Professor J. B. Cleland's address on May 17.

On June 21, Prof. Sir D. Mawson entertained the members with delightful slides and graphic descriptions of the glaciers, fiords and high mountains of New Zealand. The I.P.A. were our guests on this occasion.

"Whales and Whaling in the Antarctic" was Prof. Harvey Johnson's illustrated lecture on July 19 when the I.P.A. and the Angling Society were also present.

USE OF ROYAL SOCIETY ROOMS.

The Royal Society decided at the end of last year that all organisations using the Royal Society's rooms were to pay a rental. The Section, under these new regulations, must pay a yearly rental of 30/- which entitles it to 10 meetings per year and 3/- per meeting is charged for all extra meetings. Owing to this regulation, the Committee decided that for the present it would pay out of general funds for only five meetings per year for each of its branches using the Rooms, the branch itself to pay to the Section the cost of any additional meetings over 5 per year that it may hold. Owing to this decision, the Microscopic Branch found it necessary to go into recess as it considered that 5 meetings per year would be insufficient for its purposes.

"THE SOUTH AUSTRALIAN NATURALIST"

Our Journal has been published quarterly. Mr. W. Ham, the Hon. Editor, deserves the special thanks of the Section for his untiring devotion to this task which requires so much care and time. The pages have been taken up by some of the usual contributors whose articles have been very much appreciated from time to time. The Malacological Society of our Section have undertaken the task of writing the List of South Australian Shells which is appearing in the Journal. Mr. F. K. Godfrey and Mr. B. C. Cotton are doing the work jointly. Sir Joseph Verco and Dr. W. G. Torr are meeting the additional expense that is being incurred.

WILD FLOWER SHOW, 1931.

The 12th Annual Wild Flower Show which was held at the Adelaide Town Hall, October 16-17, was a great success in every way excepting financially. After all expenses were met the balance was approximately £7.

The inclement weather and special counter attractions were the causes of the attendance being poorer than the previous year.

HERBARIUM.—The work of the Herbarium has been maintained under the able leadership of Prof. J. B. Cleland. Poisoning, mounting and classifying of plants has been proceeded with and a parcel of grasses is almost ready to be sent to England to be dealt with by the grass expert who recently visited Australia.

THE PRESS.—The newspapers have given fair prominence to our activities during the year. "The News" and "Mail" have made very good use of material supplied from our Section. "The Mail" published a special full page article with illustrations on Saturday, 23rd July, 1932.

At the beginning of February the Section suffered a great loss in the death of Mr. D. J. McNamara and a few weeks later the news of the death of Mr. A. M. Lea was a great shock to the Section. Both of these men were very prominent in our activities and are greatly missed by all who knew them and had learned to love them so well.

Recently Mr. J. F. Bailey was suitably farewelled on the occasion of his return to Queensland.

EDWARD V. DIX, Hon. Secretary.

PROCEEDINGS.

The ANNUAL MEETING was held on August 9, when the Chairman, Mr. E. H. Ising, presided.

ELECTION OF MEMBER.

Mr. H. J. Dart was elected a member.

NOMINATIONS.

Dr. M. Schneider, Liberal Club Bldgs., North Tce., Adelaide, and Mr. H. Greaves, Director, Botanic Gardens, Adelaide, proposed by Mr. E. H. Ising.

GENERAL BUSINESS.

The following Annual Reports were read and adopted:—

1. Secretary.
2. Treasurer.
3. Fauna and Flora Protection Committee.
4. Malacological Society of S.A.

Then followed the Chairman's Address.

The ELECTION OF OFFICERS resulted in the appointment of the following:—

Chairman, Mr. E. H. Ising; Vice-Chairmen, Mr. W. A. Harding and Lt.-Col. Fulton; Secretary, Mr. E. V. Dix; Assistant Secretary, Mr. L. Reynolds; Treasurer, Miss Roeger; Magazine Secretary, Miss Roeger; Press Correspondent, Mr. E. V. Dix; Librarian, Miss J. M. Murray.

Committee.—Professor J. B. Cleland, Miss E. Ireland, Messrs. F. Triger, W. H. Selway, H. M. Hale, A. J. Morison, F. K. Godfrey and Dr. W. Christie.

Fauna and Flora Protection Committee.—Professor J. B. Cleland, Dr. C. Fenner, Messrs. E. Ashby, W. H. Selway, J. M. Black, F. Angel, W. Champion Hackett, B. B. Beck, J. Neil Mc Gilp, Captain S. A. White, Lt.-Col. Fulton, H. M. Hale and J. R. Royle.

Editor "South Australian Naturalist."—Mr. Wm. Ham, F.R.E.S.

SEPTEMBER, 1932.

The monthly meeting was held on the 20th inst., when the Chairman, Mr. E. H. Ising, presided.

ELECTION OF MEMBERS.

Dr. M. Schneider and Mr. H. Greaves were elected members.

NOMINATIONS.

Miss Howell, Pulteney Grammar School, South Tce., City.
Miss B. Dixon, 5 Spring Street, York.

Miss L. Watson, 1 Adelphi Terrace, Glenelg.

Mr. W. Parkhouse, 14 Belmore Terrace, Woodville.

The chief item was a lecture by Mr. C. W. Laubman illustrated by a cinema film depicting the following:—

The Platypus, the Koala, the Nesting of the Black Swan, the Lyre Bird, Big Timber in W.A., and the Barrier Reef.

A hearty vote of thanks was awarded on the motion of Lt.-Col. Fulton, seconded by Mr. W. A. Harding.

OCTOBER, 1932.

The monthly meeting was held on the 18th inst., the Chairman, Mr. E. H. Ising, presiding.

ELECTION OF MEMBERS.

Misses Howell, B. Dixon, L. Watson, and Mr. W. Parkhouse.

NOMINATIONS.

Miss H. M. MacKenzie, Miss E. A. Harwood, Miss G. Hill, Mr. W. A. Stow, Mr. W. H. Nelson, Dr. Everard, Miss A. Holland and Miss Jenner.

GENERAL BUSINESS.

LIBRARY.—Arrangements were made for the Librarian, Miss J. M. Murray, to be in attendance for exchange of books every Thursday between 1 p.m. and 2 p.m., in addition to the time of the monthly meetings.

LECTURE.—The Chairman, Mr. E. H. Ising, gave a lecture on a trip to the Far North, during August and September, 1932. The lecturer stayed most of the time at Pedirka, 754 miles from Adelaide on the Alice Spring line; Hamilton Bore, Dalhousie Station, via Emery Range and the Stevenson River were visited.

The country in general was an undulating gibber plain, parts of which were thickly strewn with loose stones or gibbers while low-lying portions, particularly small depressions, had the gibbers formed into a firm pavement.

Other depressions on the plain are known as "crab-holes" and these, from $\frac{1}{2}$ to 18 inches deep, were, strangely enough, quite devoid of stones. Into these depressions, which are often rivulets in the making, seeds are deposited by the wind and they develop the main vegetation of the plains. Next in abundance of vegetation are the areas with loose gibbers amongst which plants are to be found.

The small creekways leading into the larger rivers may be either lined with gidgee (*Acacia Cambagei*) or red mulga (*A. cyperophylla*) and shrubs and smaller plants of many different species.

The rivers themselves usually have two Eucalypts, the Coolabah (*Eucalyptus microtheca*) and the red guni (*E. rostrata*) and often large specimens of gidgee. The whitewood (*Atalaya hemiglaea*) was seen in the Stevenson River.

The sandhills developed needlewood *Hakea* sp., *Acacia ramulosa*, shrubs of broom (*Templetonia egena*) which is over 400 miles further north than it has previously been recorded. Grasses were plentiful, mostly *Aristida* spp.; shrubs of *Eremophila MacDonnellii* and variety *glabriuscula*; the bird flower (*Crotalaria Cunninghamii*); Sturt peas (*Glinanthus speciosus*) and many composites.

Many photographs and plant and mineral specimens were shown to illustrate the lecture. A vote of thanks followed.

NOVEMBER, 1932.

The monthly meeting was held on the 15th inst., the Chairman, Mr. E. H. Ising, presiding over a good attendance.

ELECTION OF MEMBERS.

Mr. W. H. Nelson, Miss H. M. MacKenzie, Miss Jenner, Miss E. A. Harwood, Miss G. Hill, Mr. W. A. Stow, Dr. Everard and Miss A. Holland.

NOMINATIONS.

Miss H. C. Hughes, Mr. R. Buick, Mr. J. E. Excell, Miss M. Moseley, Miss G. Williams, Mr. W. M. Nielson, Mr. Donaldson, Mr. and Mrs. L. J. Wicks, Mrs. J. D. Robert.

GENERAL BUSINESS.

The Chairman announced that 1933 would be the Jubilee of the Section and suggested a special meeting to commemorate the occasion. The first meeting when officers were elected was held on 13th November, 1883. Arrangements for the Jubilee were left to the Committee to finalise.)

LECTURE.

The evening was devoted to the study of Shells and was arranged by the Malacological Society of S.A. The first part was given by Mr. B. C. Cotton who treated the subject from the standpoint of the animal which makes the shell. Mr. Cotton illustrating the various groups of shells and their inhabitants, showed a most interesting and instructive series of lantern slides. Mr. F. K. Godfrey read a paper on the study of this subject, citing available literature and gave valuable hints for field work.

THE THIRTEENTH ANNUAL WILD FLOWER AND NATURAL HISTORY EXHIBITION OCTOBER 14 and 15, 1932.

The Exhibition was held in the Adelaide Town Hall, and we have again to thank the Lord Mayor (Mr. C. R. J. Glover) for his generosity in granting the use of the Hall on payment of working expenses. Mr. E. H. Ising was appointed Director and Secretary of the Exhibition and a Floor Committee, consisting of the various conveners.

Although a fair number of members was present, there were not sufficient to get the work done expeditiously and in time for the opening at 3 p.m. Too much praise cannot be given to the helpers.

The following sections were represented, the convener's name being placed immediately after the name of the section.

1. Scientific Classification, Mr. J. M. Black. Two tables of named flowers, grouped in families:

2. Massed Flowers, Lieut.-Col. and Mrs. D. Fulton. The stage and extension were utilised for this display, and a very fine effect was produced.

3. School Collections, Miss J. M. Murray. The following schools sent flowers which were very fine this year. We are very much indebted to the teachers and scholars who contributed to the success of the Show. The judge, Mr. J. M. Black, awarded the prizes to:—(1) Basket Range; (2) Orroroo; (3) Aldgate; (4) Monarto South; (5) Myponga; (6) Yeelanna. Other schools contributing were:—

Mylor, Echunga, Jupiter Creek, Crafers, Birdwood, Uraidla; Mt. Pleasant, Laura, Keyneton Kangarilla, Wynarka, Karoonda, Tweedvale, Wickham's Hill, Pinery, Lenswood, Heathfield, Mt. Barker, Williamstown, Cherry Gardens, Moorlands Naturi, Kersbrook and Angaston.

4. Interstate Flowers, Mr. E. H. Ising. Western Australia—Rev. R. H. Featherstone, Busselton; Mr. R. T. Stubbs, 4 Teague St., Victoria Park, Perth; Mrs. A. R. Sewell, Mt. Caroline, Kellerberrin; Mr. H. M. Beames, Kalgoorlie; Miss R. M. Buckman, Kwolyin; Miss W. Dedman, West Midland, for Field Naturalists' Club of W.A.; Mr. R. B. B. Ackland, Wongan Hills.

Victoria—Field Naturalists' Club, per Mr. J. W. Audas; orchids from Mr. E. E. Pescott; ferns from Mr. A. J. Tadgell.

New South Wales—Barrier Field Naturalists' Club, per Mr. A. Morris.

Queensland—Field Naturalists' Club, per Mrs. H. N. Slaughter, Thulimbah; Forest Photographic Scenes, per Mr. E. V. Dix.

Tasmania—Collection of plants from Cradle Mountain, per Dr. C. S. Sutton.

5. Cultivated Native Flowers. The outstanding and distinctive collection of flowers grown by Mr. W. Burdett at Basket Range was a wonderful feature of the Exhibition. Two large tables were filled from Mr. Burdett's garden and the variety of species and the colouring were the admiration of all those who came. We are deeply indebted to Mr. Burdett for the flowers which many people came specially to see. Mr. Edwin Ashby of Blackwood sent a fine assortment of natives which filled a large table and added to the interest which so many now take in the cultivation of native flora. Miss M. A. Parkhouse sent a collection from Woodville. The display on these tables was the best we have ever had.

6. Paintings, Mr. L. H. Howie; judge, Miss Lois Laughton. The Plant Study watercolour competition was well patronised and the prizes were awarded as follows:—(1) Miss M. McNichol; (2) Misses W. Burrow and A. Wood (tied). Design—(1) Miss R. Nutting. The above were for Central Schools only. Amateur Class—(1) Miss E. M. Ali; (2) Miss J. M. McDonald. Miss Rosa C. Fiveash kindly lent a large collection of her paintings of Australian flowers and they formed a fine art gallery on two sides of the Hall.

7. Minerals, Mr. E. A. S. Thomas. The Australian Radium Corporation, per Mr. J. H. Scotland, who kindly lent a range of radium ores, etc., and gave many talks on the exhibit during the course of the Show. Other exhibitors were Mr. E. A. S. Thomas and Mr. W. Ham.

8. Conchology, Mr. F. K. Godfrey. The Malacological Society of S.A. made an excellent exhibit of South Australian and other shells and various members spent hours in lecturing on the various exhibits. This section is always well represented and forms one of the most interesting displays in the Hall.

9. Aquatic Life. The S.A. Aquarium Society, per Mr. F. Blewett, staged their usual excellent series of jars containing native fishes and water plants, and the system of lighting enhanced the display very considerably.

10. Museum Exhibits. The Board of Governors kindly allowed the Curator, Mr. H. M. Hale, to select a beautiful series of showy butterflies and moths, etc., also aboriginal face masks and native weapons. These created much interest.

11. Botany Department, University. Mr. Colquohoun made an excellent display of fresh grasses, native and alien.

12. Fungi, Ephemerals, etc., Prof. J. B. Cleland. A very interesting collection of tiny plants, seeds used as food in Central Australia by the aborigines, photographs of Central Australia, specimens, was staged.

13. Engineering Dept., University. Through the kindness of Prof. R. W. Chapman, a large series of timber samples giving the breaking strain was shown.

14. Ornithology, Capt. S. A. White. A large collection of native birds was shown and lectures extending over many hours were given by Captain White.

15. Mammals, Mr. H. H. Finlayson. The rare *Caloprymnus*, after being lost to view for about 90 years and recently re-taken, and allied types mistaken for the rare species.

16. Plants of the Lake Torrens Plateaus, Miss B. J. Murray. A most interesting exhibit was prepared by Miss Murray, consisting of a large number of types from the dry region north-west of Port Augusta. The specimens were accompanied with very copious notes which added greatly to the educational value of the exhibit.

17. Agricultural Department, Mr. Warren. A large number of pressed specimens of noxious and other weeds was shown, the clear labelling enabled visitors to identify weeds of common distribution.

18. Sales' Stall, Mrs. Wm. Ham. Waratahs, everlasting, and pot plants of many good native species were purchased and found a ready sale.

19. Pressed Specimens, etc., Orchids, Mr. H. Goldsack. A large collection of orchids from New South Wales, New Zealand and Western Australia, also photographs of many Queensland specimens was arranged, and made a splendid display.

20. Eucalypts, Mr. A. D. Service. Specimens were exhibited from our own State, the West, New South Wales and Victoria. Northern Plants, Mr. E. H. Ising. Specimens were shown from Tennants Creek (sent by Mr. W. Holtze), Alice Springs (sent by A.I.M. Sisters), Pedirka, Far North, collected by Mr. Ising.

21. Microscopes, etc., Mr. W. A. Harding. Messrs. Laubman and Pank Ltd. staged a large assortment of instruments for various purposes. Mr. Harding showed for the first time in Adelaide a Microtelescope. Other members lent microscopes and slides and spent much time in explaining the latter.

22. Pond Life, Mr. J. E. L. Machell. A splendid variety of aquatic life of small insects and plants was exhibited through the courtesy of the Nature Study Laboratory of the Adelaide Teachers' College.

23. Giant Earth Worm. Mr. Chas. Barrett, on behalf of the Victorian Field Naturalists' Club, forwarded a giant earth worm about 5 feet long from Gippsland. This novelty, shown for the first time at our Shows, attracted much attention. It was afterwards presented to the Museum.

24. Cacti and Succulents, Dr. R. H. Pulleine. A most interesting collection of plants from Mexico and South Africa was shown, including a new species from South Australia (Gawler Ranges) named *Carpobrotus Pulleinei* (Order Aizoaceae).

25. Native Timbers. Mr. A. J. Wiley exhibited a large number of articles turned from our interior mulga (*Acacia aneura*) and other native timbers. Mr. E. A. S. Thomas arranged our collection of native timbers obtained from various States.

Other Exhibits were displayed as follow:—Mrs. Shepherd, a plaque on which native pressed flowers were mounted and then varnished. The Government Printing Office, copies of the handbooks of the Fauna and Flora of S.A. and coloured plates of J. E. Brown's Forest Flora of S.A. Mr. F. Martin, a book of pressed flowers from Western Australia. Mr. H. Lewcock, Clare, a collection of flowers from Tarlee (first prize at Tarlee Show), per Mr. A. J. Crawford. Mr. G. Beck, specimens of Eucalypts in flower, grown by him at Torrens Park. Mrs. C. A. Glastonbury, Sturt Peas (*Giantus speciosus*) grown by her late husband. Mr. A. Crompton, the silver-leaf daisy (*Olearia pannosa*) from Burnside. Mr. A. Beck, a collection of native plants from Marino which had grown in an area which had been enclosed for 5 years. Mr. B. B. Beck, several species of native plants grown under cultivation. The Angorichina Hostel, per Miss Cleggett, exhibited a beautiful set of furniture made by the members from red gum (*Eucalyptus rostrata*). Messrs. Allans Ltd. kindly lent a machine for reproducing the Lyre Bird record which was used frequently during the course of the Show. Mr. H. Greaves, Curator of the Botanic Gardens, kindly lent some pot plants of palms for decorating the stage and gave a number of pot plants of native species for sale. Miss Crouch, Seacliff, exhibited a painting of kangaroo paws executed by herself. Advertising arrangements were in the hands of Mr. F. Trigg who arranged with SCL to broadcast news of the Show as well as attending to advertisements and paragraphs in the two daily papers. Mr. W. Ham was responsible for the finances and the doorkeeping.

The net profits amounted to about £37. Many members and friends worked hard and for long hours, which resulted in a very successful Show. Space does not permit the mentioning all the names of those who helped, but the Committee wishes that all helpers will accept very many thanks for valuable aid on this occasion.

ERNEST H. ISING,

Chairman of the Section and Hon. Sec. of the Show.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.
Statement of Receipts and Expenditure for Year ended September 14th, 1932.

S.A. NAT., VOL. XIV.
NOVEMBER, 1932.

Forty-Ninth Annual Report.

RECEIPTS.				EXPENDITURE.			
	f	s.	d.	Sept. 14, 1932.	f	s.	d.
To Bank	2	5		By Printing and Engraving	68	12	11
" Cash in hand	5	8	8	" Postage	6	11	0
" Subscriptions	33	18	9	" Public Library	4	2	3
Other Receipts—				" Libraries & Stationery	3	10	6
Royal Society Grant	32	0	0	" Advertising	1	16	0
Donations for Magazine	22	12	6	" Hire of Rooms	5	2	0
Sale of Magazines	18	8		" Fares of Reporters	1	2	8
Sale of Book by Profs. Cle- land and Howchin	4	0	0	" Wild Flower (1930) Exs.	12	6	
Refund from Pub. Library	10	0		" Loss on Hire of Cars	18	0	
Subs. from Conversazione Bal., Wild Flower Show	2	11	0	" Wreaths	15	9	
Part Rent of Room from Shell Club	5	8	7	" Bank Balance, 14/9/32	93	3	7
Interest	15	0		" Cash in hand	15	14	0
	17	11			5	11	
Grand Total	£109	3	6	Grand Total	£109	3	6

MINNAT. P. ROEGER, Hon. Treasurer - Audited and found correct—

William H. Broadbent.

Walter D. Reed, F.I.C.A. (Aust.), Auditors

THE ORCHIDS OF COROMANDEL VALLEY, S.A.

By HAROLD GOLDSACK.

The distribution of orchids is of interest to all nature lovers, and these notes will show the surprising number of species that can be found in a small district during the year.

The locality I am dealing with lies between the southern end of Coromandel Valley and the north-eastern corner of Happy Valley Reservoir, being bounded on the northern side by the Sturt Creek, and on the southern by a road which joins Coromandel Valley with the main South Road. This area comprises approximately one square mile and a half. Most of the ground is thickly covered with Peppermint Gum (*Eucalyptus odorata*) with scattered patches of Yacca (*Xanthorrhoea semi-plana*), while in the gullies are several species of larger Eucalypts. Large sandy patches contain a lower and more bushy type of scrub, and it is among these plants that the orchids thrive best.

September and October are the orchid months par excellence. During these months I have found 19 and 25 species respectively. January, February, and March are very lean times for orchid collecting here, and the only species to look for is *Dipodium punctatum*, R.Br.; even this one is missing from my list, but can be found at Cherry Gardens a few miles away, and so may possibly occur here.

April, 3 species; May, 4; June, 6; July, 9; August, 8; November, 13, and December 2, show the way in which the flowering period is spread out. Naturally, one particular species will flower for two or three consecutive months, and this should be remembered when considering these figures.

In the following list of species I will adhere to the order in which Dr. R. S. Rogers places them in J. M. Black's "Flora of South Australia," to enable those interested to look up their descriptions easily.

Calochilus Robertsonii, Benth. One plant of this beautifully-bearded orchid was found by the banks of the Sturt Creek.

Thelymitra luteociliata, Fitzg. occurs plentifully, but never makes an attractive picture owing to the fact that the flowers seldom open. In cold weather many never do open, and yet set seed readily, being self-fertilized.

T. grandiflora, Fitzg. is but lightly distributed.

T. aristata, Lindl. in my opinion is our most beautiful *Thelymitra*. The flowers open readily in dull sunshine, and their fragrance is delightful.

T. pauciflora, R.Br., *T. carnea*, R.Br., and *T. flexuosa*, Endl. are all small-flowered species, the last-named being uncommon here.

T. antennifera, Hook.f. is the sweetly-scented, yellow-flowered plant. On sunny days it makes the scrub a fairyland thronged by eager courtiers, all reflecting the lustre of their king, the sun. All the species of *Theelmitra* favour open ground where they receive plenty of sunshine.

The genus *Microtis* is represented by two species, *M. porrifolia*, Spreng., and *M. oblonga*, Rogers., both being fairly common. They may be distinguished one from the other by the emarginate-tipped labellum, which the former possesses, while the latter has an entire labellum.

Prasophyllum is a genus with many species of similar appearance and with many intermediate forms. One which is common here is *P. odoratum*, Rogers. Others also found in the district are *P. patens*, R.Br., and a few plants of *P. Fitzgeraldii*, Rogers et Maiden.

P. nigricans, R.Br., one of the dwarf species, is abundant when searched for, but can easily be overlooked through being so diminutive.

The helmet orchids *Corysanthes* sp. were critically revised in 1928 by the Rev. H. M. R. Rupp, and W. H. Nicholls with the result that two of our species have changed their names. The larger of the two in question was known here as *C. fimbriata*, R.Br., but the joint authors showed that that species was not found in South Australia, and described our plant as a new species *C. dilatata*, Rupp and Nicholls. This plant has its flower standing high off the leaf, and the tubular portion of the labellum shows below the circular lamina when viewed from the front. The smaller plant, which was known here as *C. pruinosa*, Cunn., was shown to be *C. diemenica*, Lindl. The flower of this species is placed close to the leaf and the lamina of the labellum hides all the tubular part behind it. Both of these species should be found in this locality, but so far I have found but one, *C. diemenica*, Lindl. These were growing in a moist gully behind the butts of gum trees and in the shade of yaccas.

Our dainty mosquito-orchids are represented by two species, *Acianthus exsertus*, R.Br., and *A. reniformis* (R.Br.), Sch. (*Cyrtosylis reniformis*, R.Br.). Both are abundant, and are found in large communities in deep moss and rotting leaves where their tubers can spread easily. I have found some young tubers eight inches away from the parent plant.

One of our most beautiful orchids is *Hyperanthus nigricans*, R.Br., sometimes called the "mournful flower." The leaves of

this species can be found anywhere in sandy ground, but they are seldom found in flower. Just why this should be so is a problem of orchidologists. (They flower after bush-fires—Ed.).

A tiny autumn-flowering plant is *Eriochilus cucullatus* (Labill.) Reichb.f. (*Eriochilus autumnalis*, R.Br.). The flowers of this plant seem to push up through the hardest of ground, and afterwards the leaf comes up and develops. They are quite plentiful in April.

The genus *Caladenia* is well known to most people as containing the spider orchids. Of the spidery type, the commonest here is *C. leptochila*, Fitg. It is most abundant. *C. dilatata*, R.Br., is also very plentiful and unfortunately is ruthlessly picked by thoughtless holiday-makers. *C. reticulata*, Fitg., is common at Blackwood, but two solitary plants are all that I have found here. It is difficult to understand why there should be such a disparity in the numbers of one species in two adjacent districts when other species are so common in both.

C. Patersonii, R.Br., the beautiful cream and pink-flowered species is becoming noticeably rarer each year. A bush-fire has a profound effect on the flowering of some orchids, and this was demonstrated to me one year by a patch of *C. Menziesii*, R.Br. This patch, which was about six feet square, contained hundreds of plants from which in normal years one or two dozen flowers were produced; the season following the bush-fire every plant in the community, no matter what its size, burst into flower and clothed the ground with a mantle of pink and white. It was almost impossible to find a leaf without a flower. One of my treasures here is a community of albedo plants of this same species. The flowers are little gems of snow-white purity.

C. carneae, R.Br., and *C. latifolia*, R.Br., favour damp gullies and other moist places.

C. deformis, R.Br., is well known to all, and is very plentiful here.

Glossodia major, R.Br., is the orchid which takes the prize for making the best show in this scrub. It is a delight to see the ground covered with these beautiful purple flowers, all facing upwards to catch the spring sunshine.

Very popular among wild flower gatherers are the species of *Diuris*. Unfortunately so! Of these we have here *D. pedunculata*, R.Br., a common yellow-flowered plant with several forms, some being tall and slender, and others short and robust with flowers as different as their habit.

: *D. palustris*, Lindl. A very sweetly-scented brown and yellow-flowered plant; the scent is most noticeable when the flowers are in strong sunlight.

D. maculata, Sm., and *D. palachila*, Rogers, are found growing together, but once known can be distinguished quite easily.

D. longifolia, R.Br., has brownish flowers shaded like the garden wallflower. It, also, is common.

Orthoceras strictum, R.Br., flowers in the heat of summer on open mossy ground, often in places where *Caladenia deformis*, R.Br., had been plentiful earlier in the season.

For our last genus we come to the plants called "Greenhoods." Of these I have not seen *Pterostylis curta*, R.Br., for some years. It may be exterminated.

P. nana, R.Br., is very plentiful. One year I noted it as flowering from May to October, a remarkable flowering period for any orchid in one district. Occasionally one comes across a two-flowered plant of a species which usually has solitary flowers, and both this last species and the next have been found here bearing two flowers.

P. robusta, Rogers, is the plant long known as *P. reflexa*, R.Br., and, like many others of the genus, grows in large communities.

P. pedunculata, R.Br., favours very moist places in this district. Its real home appears to be higher up in the hills.

P. barbata, Lindl., is well known by its hairy protruding labellum, and occurs in some scattered patches.

P. pusilla, Rogers, is the sole representative of the summer-flowering greenhoods that I have found here. Our plant, which is found at Blackwood and Eden Hills as well, is slightly different in some small details to the type form. It is found in flower in November, and, unlike the type form, has no green leaves then.

One of our most interesting orchids, and the last in this list is *P. vittata*, Lindl. Nearly all nature lovers are acquainted with the flowers of this plant, and their sensitive labella. It is quite common at present, but may become scarce under grazing.

This brings the number of species which I have found in this small locality to 41, and no doubt several more remain to be discovered in the future. Nature lovers will feel that they need not do any extensive travelling in order to obtain an insight into the habits of these beautiful and fascinating plants, for Nature has been lavish in her distribution of them in our hills.

HUMBUG SCRUB TRIP—January 30th, fare 5/-. NOTE! Cars leave at 9 a.m. and not at 2 p.m. as stated in program.

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).

PART VI.

By BERNARD C. COTTON and F. K. GODFREY.

In this part the following families are treated:—

Acteonidae, Obeliscidae, Strombiformidae and Stiliferidae.

ACTEONIDAE.

Shell capable of containing the entire animal; spiral, with projecting or depressed spire; whorls moderately numerous, internal whorl-partitions not absorbed; surface generally sculptured with spiral punctured grooves; mouth rounded below, with or without columellar folds; operculum horny, few-whorled. Distribution—World-wide. Fossil—Trias; North America, Europe, South India. Animal having a well developed head-disc, bearing the sessile eyes, and prolonged into triangular processes behind; lateral epipodial lobes not developed; proboscis not retractile. Sexes united in the same individual.

Acteon Montfort 1810 (= *Tornatella* Lamarck 1812; = *Speco* Risso 1826; = *Kanilla* Silvertop 1838; = *Myosoto* Gray 1847). Oval, rather solid; wholly or partly grooved spirally, with fine accremental lamellae which punctuate only the hollow of the groove; spire generally shorter than last whorl; protoconch slightly prominent, deviated, heterostrophe; sutures well marked; mouth elongated, rounded below, narrowed above; outer lip curved, slightly sinuous above, thickened inside; columella thick, not truncated; crossed by a strong spiral and slightly oblique fold; operculum horny, shaped like the mouth, few-whorled, with nucleus near basal margin. Type *A. tornatilis* Linne (British Isles). Animal having the cephalic shield squared in front, produced behind in two triangular appendages, in front of the bases of which the eyes are situated.

A. retusus Verco 1907. "The Blunt Acteon." Oval, thin; shining, translucent, yellowish-white; spiral incisions, six in the penultimate, forty in the body-whorl, extending, crowded and fine, to the columella; axial striae, delicate, close-set, cross the incisions, which they punctuate, climb, and crenulate their sides, and traverse the intervening flat spiral bands; protoconch of one whorl, apex immersed, convex, smooth, ending abruptly in an oblique retrocurrent scar; adult whorls five, convexly sloping, roundly shouldered immediately below the suture; body-whorl roundly-obliquely cylindrical; suture deeply narrowly channelled;

mouth obliquely-arcuately pyriform; outer lip simple, finely crinkled outside; basal lip well-rounded, its inner half distinctly everted; columella with a wide, simple oblique fold; umbilicus small. Height 9.4, diam. 6.1 mm. (Type locality—200 fathoms, off Beachport), also Cape Jaffa, and N.W. of Cape Borda 60-130 fathoms.

A. areatus Verco 1907 (*A. roseus* var. *areatus* Verco). Pl. 1, fig. 1. "The Oblong-blotted Acteon." Oblong-ovate, thin, rather shining; whitish, with scarcely oblong areas of light rusty-brown, on the body-whorl three axially and seven spirally, separated by the wider of two spiral lirae, and reaching as high as the wide infra-sutural lira; all except the protoconch banded with spiral cords rather wider than the interspaces, twenty-six or twenty-eight on body-whorl; mouth and columella fold white; axial striae fine in the interspaces, thickened where they touch the spirals; protoconch subacute of two turns; convex, smooth; adult whorls six, convex, last whorl more than five times as long as the spire, rounded; mouth oblique, elongated, inverted ear-shaped; outer lip nearly straight, rounded below, crenulated without, smooth within; inner lip a fine glaze; columella with one rounded fold and a furrow above it. Height 14, diam. 8 mm. Dredged Gulf St. Vincent, Investigator Strait, Spencer Gulf, 15-25 fathoms. (Type locality—Investigator Strait, 18 fathoms).

Pupa Bolten 1798 (= *Solidula* Fischer de Waldheim 1807; = *Dactylus* Schumacher 1817; = *Buccinulus* H. & A. Adams 1858; = *Tornatella* of authors). Ovate or oblong, solid, spire short, conical; mouth two-thirds or more as high as the shell, narrow above, rounded below; columella with a massive bilobed spiral fold, outwardly curving into the lower margin of the peristome; parietal wall with one or more smaller folds; operculum transverse, elongated, curved, with imbricate elements and a linear scar. Type—*Voluta solidula* Linne (Philippines).

P. intermedia Angas 1878 (*Buccinulus*). Pl. 1, fig. 2. "The Intermediate Pupa." Elongately ovate, shining; white, with two bands of irregular descending brown flames and spots; spiral striae, grooved and finely punctured, numerous, becoming obsolete on centre of last whorl; spire acuminate, as long as the mouth; whorls six-and-a-half; sutures strongly impressed; outer lip simple, thin; columella with a strong bilobed fold near the base, and a smaller projecting plate above it; inner lip with a broad and spreading callus. Height 12, diam. 5.3 mm. Not common. Beach, Pt. Willunga, Rapid Head, Hardwicke

Bay; dredged Backstairs Passage, Gulf St. Vincent, Spencer Gulf, Cape Borda, 14-62 fathoms. Also Albany, W.A. beach to 35 fathoms. (Type locality—Aldinga Bay). The spiral incisions may be equidistant all over the body-whorl, or absent from the upper half of the body-whorl. Allied to *P. affinis* Adams from N.S.W. but differs somewhat in form and style of colouration.

P. hyalina Verco 1907. "The Hyaline Pupa." Minute, transparent, fusiformly oval; colourless; spiral incisions, sub-lenticular, wavy, cover the body-whorl; growth striae, very fine, rather sinuous; protoconch distinct, glassy, smooth; adult whorls about four, sloping, convex; suture adpressed; mouth narrow, long, pyriform; outer lip simple, thin, continued into a round basal lip, which is thickened towards the columella; inner lip expanded slightly beyond the columella, over the umbilicus; a curve of the columella forms a fold running into the basal lip, and a second well-marked oblique fold where the columella joins the body-whorl. Height 3, diam. 1.5 mm. (Type locality—Fowler and Streaky Bay). Also Beach, Normanville, Carawa Beach, Brothers Island, Coffins Bay.

Leucotina A. Adams 1860 (= *Myonia* A. Adams 1860: = *Monoptygma* A. Adams 1851). Ovate or elongated, usually rimate, thin; whitish; spiral grooves punctured or subpunctate; whorls convex; mouth rather small, oblong, produced and round-below; outer lip simple or crenulated within; columella with an oblique fold. Type—*L. niphonensis* A. Adams (Japan).

L. concinna Adams 1854 (*Tornatella*) (= *Rissoa punctostriata* Tenison-Woods 1878: = *Fossarus bulimoides* Tenison-Woods 1876: = *Acteon austrinus* Watson 1886). Pl. 1, fig. 3. Ovately turreted, umbilicated; grayish-white; spirally grooved, interstices microscopically crenulated; spire elevated; protoconch obtuse; adult whorls about five, flatly convex, angulated above; suture distinct; mouth oval, produced below; outer lip lirate within; columella with oblique fold, somewhat obsolete. Height 13, diam. 5 mm. Dredged, Backstairs Passage, Investigator Strait, Gulf St. Vincent, 15-20 fathoms. Also Albany to Bunbury, W.A., beach to 22 fathoms. (Type locality—Moreton Bay). Examples vary considerably in their relative width and in the number of their spiral lirae.

L. micra Pritchard & Gatliff 1900 (*Turbonilla*) (= *Syrnola puntospira* Tate & May 1900). "The Tiny Leucotina." Bulimoid; white; spiral lines, very fine, microscopically pitted; protoconch of one-and-a-half turns, oblique apparently smooth but pitted microscopically; adult whorls about three, slightly

convex; suture fairly impressed; mouth about one-third of length of shell, elongate oval, broadly rounded below, slightly effuse; outer lip thin, thicker within, somewhat flattened towards the suture; inner lip reflected over a slight umbilical chink. Height 2, diam. .75 mm (Type locality—Phillip Island, Western Port, Vic. in shell sand from 4 fathoms).

Opimilda Iredale 1929. Short, squat, umbilicated; spiral and axial riblets, well marked; protoconch paueispiral bulbous, smooth, set almost at right angles to the rest of the shell; mouth subquadrate; outer lip simple; columella expanded anteriorly, meeting the lip at an angle. Type—*Mathilda decorata* Hedley 1903.

O. decorata Hedley 1903 (*Mathilda*). Pl. 1, fig. 4. "The Decorated Opimilda." Broad, turreted; pale-brown; two spiral projecting keels on the periphery mount the spire, with two minor cords above them, and one plain cord bordering the suture; axial riblets about twenty-five arise, outside the basal border and mouth, perpendicularly to the summit of the shell; these produce a bead at each point of intersection with the four spirals and cut their interstices into square meshes; spiral threads few, fine, on the otherwise smooth base, which is bounded by a double smooth cord; protoconch large, of more than one whorl, smooth, set on edge at one side of summit; adult whorls four-and-a-half; outer lip dentate by the sculpture; umbilicus, a chink. Height 4.25, diam. 2 mm. Dredged Cape Wiles 100 fathoms. (Type locality—Port Kembla N.S.W. 63-75 fathoms).

Cingulina Adams & Angas 1860. Tapering, turreted, whorls numerous, spirally ribbed, interstices sculptured; mouth somewhat oblong, rounded below; outer lip sharp, curved; inner lip straight, simple. Type—*C. circinata* A. Adams (Japan). This genus most nearly resembles *Monoptygma* in form and sculpture; but in the straight inner lip and absence of parietal fold it is like *Turbonilla*. The spiral ridges suggest *Aclis*, but the form of the mouth is very different.

G. spina Crosse & Fischer 1864 (*Turritella*) (= *Aclis tristriata* Tenison-Woods 1876). Pl. 1, fig. 5. "The Thorn-like Cingulina." Small, conical, turriculate, regular, not umbilicated; white; spiral ribs, three, strong, rounded; last whorl bears a fourth rib finer than the others, near the base, which is smooth; whorls numerous, flat, increasing slowly; suture indistinct; mouth somewhat quadrangular; outer lip simple; inner lip short. Height 14, diam. 3.4 mm. Robe to Ameriean River (Kangaroo Island) and Smoky Bay, beach and down to 130 fathoms. Not common. Also Albany to Bunbury W.A., 22 fathoms. (Type locality—

Gulf St. Vincent). Very variable. May be very attenuate, or comparatively wide; uniformly tapering or posteriorly spindle-shaped; valid or obsolete spiral ribs; last whorl may be very ventricose; cingula usually nearly equal, but the central one may be more developed and the suture may be wide, deep, and distinct.

C. diaphana Verco 1906. "The Diaphanous Cingulina." Thin, diaphanous, conical; white; spiral lirae, seven, valid, scabrous from microscopic growth striae, obliquely receding from the suture; protoconch asymmetrical, smooth; adult whorls six, medially keeled; body-whorl with a stouter lira at the periphery and a deeper groove below it, and seven basal lirae; base sloping; suture well marked, slightly channelled; mouth slightly contracted above, and narrowly effuse below; outer lip simple; inner lip complete. Height 2.1, diam. .7 mm. Henley Beach (Type locality,), also dredged Gulf St. Vincent.

C. magna Gatliff & Gabriel 1910. "The Large Cingulina." Gradually tapering, shining; uniform creamy-white; spiral grooves, irregularly spaced, narrow, shallow, six on the penultimate whorl, gradually fading out on the earlier whorls; protoconch of two turns, smooth, the apex small, asymmetrical; adult whorls nine, slightly convex, the earlier ones transversely pucker-ed at the shoulder; suture incised; base rounded; mouth pyriform; outer lip thin; continuous to where it joins the columella, slightly reflected at the junction. Height 10.5, diam. 2.75 mm. Generally distributed, but not common, beach and down to 130 fathoms. (Type locality—Western Port, Vic.).

OBELISCIDAE.

Turreted, axis plicate; outer lip frequently internally lirate; in the larger forms the mouth is obscurely channelled in front; larval shell sinistral, the adult dextral; protoconch frequently set at an angle to the adult axis, or more or less immersed in the adult apical whorls; sculpture, when present, ribbed, spirally sulcate, or reticulate; coloration, when present, usually reddish, brownish, or yellow; operculum ovoid, paucispiral, with anterior apex, a thread-like arcuate ridge on the outer side, the inner margin notched in harmony with the folds of the columella when present. Distribution—World-wide, the larger forms mostly tropical. Fossil—Cretaceous, numerous in the Tertiary, but perhaps most fully developed in the existing faunas. Animal with two flattened, subtriangular or elongate tentacles, grooved or auriform in the larger forms, the funicles with a ciliated area; below the tentacles an oral orifice, from which extends a long,

retractile, subcylindric proboscis, but there is no muzzle like that of *Scala*; below the oral orifice is a distinct elongated flap, the mentum, which is usually more or less medially grooved or fissured; foot short, moderately pointed behind, with a small operculigerous lobe above and sometimes a small tentacular appendix on each side, and double-edged in front; mantle slightly canaliferous on the right upper margin; a single gill-plume. Sexes distinct. *Pyramidellidae* = *Obeliscidae*.

Syrnola A. Adams 1860. Very small, tapering, straight, vitreous, polished; protoconch sinistral; adult whorls flattened, suture well marked; mouth somewhat oblong, outer lip simple, columella with a single plication. Type—*Syrnola gracillima* A. Adams (Japan). This genus was set up for banded translucent *Odostomia*.

S. aurantiaca Angas 1867 (*Styloptygma*) (= *Eulima aurantia* Petterd 1884). "The Golden Syrnola." Acutely elongate, rather thin, shining; fulvous orange with a pale band next below the sutures, darker on the lower whorls, fading into white on the upper whorls, which are glossy and transparent; axial striae, fine; spire turreted; whorls eight, slightly convex; suture impressed; mouth small, narrowly ovate, produced anteriorly; columella fold small and rudimentary. Height 6, diam. 1.5 mm. Beachport to St. Francis Island, beach to 55 fathoms. Rare. (Type locality—Port Jackson N.S.W. from deep water). May referred to the colour as orange-and-white in Tasmanian specimens.

S. bifasciata Tenison-Woods 1875 (*Obeliscus*) (= *O. jucundus* Angas 1877). "The Two-banded Syrnola." Acutely elongate, thin, shining, polished, subtranslucent; horny or whitish, with two light brown bands, three on the body-whorl; axial striae, fine; protoconch mamillate, sinistral; adult whorls nine, flatly convex; suture impressed; mouth pear-shaped; outer lip thin; inner lip reflexed; columella fold not conspicuous. Height 7, diam. 2 mm. Beach and down to 150 fathoms, Beachport S.A. to King George Sound W.A. Not common. (Type locality—Long Bay, Tasmania).

S. brunnea A. Adams 1855 (*Obeliscus*). "The Brown Syrnola." Elongately tapering; brown or reddish-brown; axial striae, fine; whorls very numerous, flattened, slightly crenulated at the suture, last whorl rounded; suture deep; mouth oval, rather expanded anteriorly; columella straight, reflected below, expanded, with one fold. Height 20, diam. 5 mm. Encounter Bay S.A. to Bunbury W.A., beach and down to 150 fathoms. Not common. (Type locality—Japan). South Australian specimens are slightly broader than those from Japan.

S. infrasulcata Tate 1898 (*Odontostomia*). "The Basally-grooved Syrnola." Narrow-lanceolate, not umbilicated, shining; white; axial striae, feeble; about six spiral incised lines on base; protoconch sinistral; adult whorls about eight, flat, body-whorl subangulate at the periphery; suture linear; mouth narrow, oval; outer lip not ribbed within; columella with one very prominent fold, in front of which the inner lip is effusively expanded, and its margin reflected. Height 11, diam. 3.5 mm. Holdfast Bay, beach, (type locality); also Waurauitie, Spencer Gulf, in shell sand; dredged Rapid Head, Beachport and Cape Borda 10-150 fathoms. Much like *S. gracillima* A. Adams, the type of the genus, but larger. There may be up to five grooves on the body-whorl above the periphery, some of which are continued submedially on the spire whorls. The species is conspicuous by its elongate-oval mouth, effuse below, and the sulci on the base of the body-oval mouth, effuse below, and the sulci on the base of the body-whorl.

S. tincta Angas 1871 (*Pyramidella*) (= *S. michaeli* Tenison-Woods 1876). "The Tinted Syrnola." Tapering, rather solid, shining; whitish, irregularly banded and marked with brown; smooth; whorls ten, nearly flat; suture deeply impressed; mouth ovate; outer lip thin; columella with one rather prominent fold. Height 6, diam. 1 mm. Beach Grange, Yankalilla, Venus Bay, Sceales Bay; dredged Gulf St. Vincent, Cape Borda, Neptune Islands, Beachport, 5-104 fathoms; also Western Australia, beach, Ellensbrook, Yallingup, Bunbury, Rottnest Island, Hopetown, Albany. (Type locality—Port Jackson N.S.W.). There is a translucent, colourless, form (a) with whorls slightly round, bearing obsolete axial subcostate plicae; there are two forms larger than the type, one of which forms (b) is narrower, and distinctly two-banded with brown; another form (c) of similar size to the type is narrower and more cylindrical, with a comparatively large protoconch, the shell having brown bands and blotches. The fine spiral and axial markings are formed on all recent individuals.

S. unisulcata sp. nov. (not *S. jonesiana* Tate 1898). Pl. 1, fig. 6. "The Single-grooved Syrnola." Small, long, narrow, acute, thin, polished; white; spiral striae, sublenticular, fine; axial striae, very fine; protoconch sinistral, oblique, smooth, of two-turns; adult whorls eight, upper whorls rather convex, lower whorls almost straight sided; one fine sulcus at the suture runs round the body whorl and penultimate fading away on the anti-penultimate; suture narrowly channelled; mouth pyriform; outer lip slightly effuse, and evenly curved; columella with a single

sharply curved fold. Type—Height 7, diam. 1.8 mm. Rottnest Isand W.A. (Reg. No. D10626 S. Aust. Mus.) Beach, Gulf St. Vincent, Port Lincoln, also dredged Cape Borda 55 fathoms. Previously mistaken for *S. jonesiana* Tate, a Pleistocene fossil from the Tintinara bore, which is without sculpture. *S. unisulcata* is larger, and the periphery less rounded. Examples vary in width of sutural channel and convexity of the whorls.

S. jonesiana Tate 1898 (*Odontostomia*). "Jones' Syrnola" Narrowly pyramidal, shining; white; smooth; whorls eight, of moderately rapid increase, flat; base regularly convex; suture linear, well defined; mouth pyriform, with a stout elevated fold at the origin of the columella, inner front angle of mouth slightly effuse and thickened with a slightly reflexed edge. Height 6.25, diam. 2 mm. Type, a Pleistocene fossil from the Tintinara bore. The species is broader than *S. tincta* but differs in its longer mouth and the far-backward position of the columella-fold; in its apertural characters it resembles *S. infrasulcata* which is, however, a robust shell, and has a sculptured body whorl. The description is given here, but we have not seen recent S.A. specimens conforming with it. Recent specimens in the S.A. Mus. identified as this species, appear to be worn *S. unisulcata* (see above).

S. elliotae sp. nov. Pl. 1, fig. 7. "Elliott's Syrnola." Elongate oval, rather solid, shining, polished, translucent; white, with one brown band immediately above the suture in the spire whorls, running round the body whorl to the middle of the outer lip; axial growth striae, very fine, numerous; protoconch globose, mammillate, sinistral, smooth, oblique, of two turns; adult whorls eight, flatly convex; suture impressed; mouth pyriform; outer lip simple, thin; inner lip reflexed; columella with one fold curving uninterruptedly into the basal lip. Type—Height 8, diam. 2.3 mm. King George Sound W.A. 22-28 fathoms. (Reg. No. D10627 S. Aust. Mus.). Also Gulf St. Vincent, 1 specimen. More solid than *S. bifasciata* Tenison-Woods, and more pupaeform in the early whorls, profile is curved instead of straight; the columella fold curves into the basal lip, while that of *S. bifasciata* is somewhat straight and vertical here, with a second rudimentary fold. Named after Mrs. E. C. Elliott, a foundation member of the Shell Club, 1925, afterwards the Malacological Society of South Australia, and a painstaking collector on many Queensland, New South Wales, Tasmanian and particularly South Australian beaches.

Odostomia Fleming 1813 (= *Odontostoma* Philippi):

Odous=a tooth, **stoma**=a mouth. Oval, conoidal or turriculate, umbilicate; typically smooth; protocouch sinistral of one or two turns; suture well marked; mouth oval; peristome mostly discontinuous; columella with a single tooth-like fold; operculum horny, lamellar, subimbricated, with a median spiral groove, inner margin indented. Type—*Turbo plicatus*... Montagu (South of England). Animal elongated, head large and robust, bearing two conical tentacles, with eyes at their bases; foot depressed, truncated in front; mentum anteriorly bilobed. The shells are very small, usually smooth, and are found at low-water mark beneath loose stones, and at the base of small seaweeds in rock-pools; others are found in the laminarian zone, and some occur in deep water; some again live in brackish water. They subsist on soft animal substances, the radula being without teeth. Certain Northern species are commonly found on the "ears" of Pectens, and, from their habitual proximity to the excretory passage of the scallop, it is inferred that they subsist on its faeces. The species are prolific and widely diffused. The sinistral protocouch is a constant feature of the gems. In the S.A. Museum are many new species from Southern Australia yet to be described.

O. angasi Tryon 1886 (= *O. lactea* Angas 1867, preocc. Dunker). "Angas' Odostomia." Elongate, rather thin, shining; white; smooth; whorls six, flattened; suture impressed; mouth small, ovate, somewhat produced anteriorly, one third the length of the shell; outer lip thin, simple; columella with one strong, oblique fold. Height 6, diam. 2 mm. Beach, MacDonnell Bay, Port Willunga; dredged Gulf St. Vincent, Cape Jaffa, down to 130 fathoms. (Type locality—Port Jackson, N.S.W., in deep water.)

O. australis Angas 1871 (*Agatha*) "The Southern Odostomia." Acuminate, solid; whitish; decussated with axial ribs and more numerous spiral ridges, the axial ones evanescent at the base; whorls nine; sutures impressed; mouth nearly circular, entire. Height 10 diam. 2 mm. Rare. Beach—Gulf St. Vincent, Port Macdonnell; also dredged Beachport, St. Francis Island, 15-40 fathoms. (Type locality—Port Jackson, N.S.W.) South Australian specimens average a little shorter and broader than the type, though apparently the same species.

O. deplexa Tate and May 1900. Pl. 1, fig. 8. "The Embracing Odostomia," in allusion to the concealed protocouch. Elongate oval, moderately stout, shining; white; smooth, except for microscopic growth lines; protocouch concealed, except the

papillary-like tip of the loop; adult whorls five, convex, slightly protuberant at the suture above; mouth oval; columella with a strong transverse fold at its origin. Height 3 diam. 1.1 mm. Beach, Port Willunga, dredged, Newland Head, 28 fathoms. Also beach Rottnest Island, W.A. (Type locality—Frederick Henry Bay, Tasmania.) Most like *O. laevis*, but the whorls are more convex, shell more cylindrical, and much smaller.

O. laevis Angas 1867. "The Smooth Odostomia." Ovately conical, thin, subdiaphanous, shining; white; whorls seven, a little rounded, last whorl not quite one half the length of the shell; sutures channelled; mouth oblong-ovate, a little produced anteriorly; outer lip thin, acute, simple; columella with a strongly developed, transverse fold. Height 7 diam. 3 mm. Beach, Gulf St. Vincent, Murat Bay, Venus Bay; dredged Rapid Head, Beachport, Cape Jaffa, 10-130 fathoms. (Type locality—Port Jackson, N.S.W.) A variant from Port Willunga is as long, more solid, sutures more channelled, mouth much shorter, throat has spiral striae.

O. mayi Tate 1898 (*Odontostomia* ..[*Pyrgulina*]). "May's Odostomia." Conoidally turreted, rather solid; dull white; axial ribs, rounded oblique, wider than the interspaces, which are not sculptured; last whorl with about twenty axial ribs, which terminate at a spiral groove on the periphery; base somewhat flattened, radially ridged, defined by a spiral rib, which margins the peripheral groove; adult whorls five; suture deeply and broadly channelled; mouth oval; outer and inner lips joined by a callus; columella with one stout fold. Height 2-5, diam 1 mm. Rare. Beach, St. Francis Island; dredged, Gulf St. Vincent, St. Francis Island, Beachport, 20-40 fathoms. Also King George Sound, W.A. (Type locality—D'Entrecasteaux Channel, Tasmania.)

O. metcalfei Pritchard & Gatliff 1900 (*Odontostomia*) (=*O. eburnea* Metcalfe, MS. in British Museum). "Metcalfe's Odostomia." Biconic, thin, translucent; milky-white; axial striae, faint; protoconch sinistral of one-and-a-half turns with immersed tip; adult whorls three to four, somewhat convex; suture distinct; a narrow margin running parallel to and a little below the suture; mouth ovate, slightly effuse anteriorly; columella, with one strong tooth-like fold at the middle of the mouth; outer lip thin. Height, 2.5 diam. 1-25 mm. Rather rare. Beach, Yankalilla, Grange, Beards Bay, St. Francis Island, Murat Bay; dredged; Backstairs Passage, Gulf St. Vincent down to 35 fathoms. Also beach, King George Sound, Rottnest Island, W.A. (Type locality—Flinders, Western Port, Victoria).

O. pupaeformis Sowerby 1865 ($= O. kreffti$ Angas 1867). "The Pupa-like Odostomia." Ovate oblong, white; axial ribs seven, valid, as wide as the interstices which are spirally striate; whorls nine, slightly convex; suture rather deep; mouth small, ovate, oblique; outer lip simple; columella with two folds, the higher rather conspicuous. Height 5.5 diam. .75 mm. Dredged, Beachport to Port Lincoln, 9-200 fathoms. Also Geraldton, Ellensbrook, Rottnest Island, Bunbury, W.A. (Type locality—New Caledonia). Rather variable. The costae may be continued to the columella, and there may be a narrow spiral lira just above the suture between the ribs. Another form is without spiral striae. Others are shorter, whorls more convex, costae nine instead of seven and more sinuous, spiral threads much more numerous. This last form taken from beach, St. Francis Island, and King George Sound, W.A., and dredged to 55 fathoms.

O. simplex Angas 1871. "The Simple Odostomia." Acuminately ovate, rather solid; whitish; smooth; whorls seven-and-a-half, rather flat, a little angulate at the suture; mouth subovate, lirate within; outer lip simple, with elevated striae within; columella with a single, sharp transverse fold. Height, 4 diam. 1.5 mm. Dredged, Gulf St. Vincent, Investigator Strait, Backstairs Passage down to 19 fathoms. Also Geraldton, W.A. (Type locality—Port Jackson, N.S.W., dredged.) There is a ventricose variant somewhat channelled at the suture, dredged Gulf St. Vincent and Cape Borda down to 55 fathoms. Another and smaller form, about 3 mm. with a diameter of 1 mm. showing spiral folds within the throat, taken on beach, Kingston, Tourville Bay, and dredged Beachport to St. Francis Island, 35-62 fathoms.

O. suprasculpta Tenison-Woods 1877 (*Rissoina*) ($= O. varians$. Tate and May, 1900). "The Top-sculptured Odostomia," in allusion to the peculiar sculpture on the top or upper portions of the whorls. Acuminately oval; whitish or translucent horn; spiral grooves, four, deep, narrow, irregularly spaced, the first three grooves are relatively wide, the fourth is a slender lineation sunk in the sutural canal; the first and second ligatures are broken up into blunt, straight, axial ridges, or studded with small granules (some translucent specimens are without sculpture save for faint spiral furrows on the body whorl); protocouch pellucid, smooth, papillary as a whole, forming a small lop-sided bend; adult whorls five, flatly convex; suture broad, deep; mouth oval; columella slightly arched, with a slender fold above; an

umbilical chink formed by the thinly and sparingly exsert inner lip. Height 3, diam. 1.4 mm. South Australia, very rare. Beach—King George Sound, W.A. (Type locality—Long Bay, Tasmania.)

O. victoriae Gatliff and Gabriel 1911. "The Victorian Odostomia." Elongated, acicular; white; spiral incised lines, microscopic, numerous, that at the periphery of the body whorl being well defined; adult whorls nine, slightly convex; suture incised; mouth ovate; inner lip slightly everted; columella with a moderately strong ascending fold; situated well within the mouth. Height 7, diam. 2.6 mm. Rare. Fowler's Bay, Gulf St. Vincent, MacDonnell Bay. Also King George Sound, W.A. (Type locality—Port Albert, Victoria.) A thin vitreous shell of a regularly tapering form. Specimens apparently closely allied to *O. victoriae* are in the S.A. Museum collection identified as *O. densesstriata* Garrett (Id. Sir J. C. Verco), a Viti Island species. They are more closely allied to *O. victoriae*.

O. vincentiana Tryon (=*O. gracilis* Angas 1878 [*Parthenia* preocc.]). "The Gulf St. Vincent Odostomia." Elongately turreted, rather thin; white; axially ribbed, the interstices crossed by very fine spiral striae; whorls seven-and-a-half, slightly convex; contracted above and below the suture; suture strongly impressed; mouth quadrately ovate; columella with a single sharp tooth-like fold. Height 5, diam. 1 mm. Beach, Grange, Yankalilla, Robe, MacDonnell Bay, uncommon. Dredged, Backstairs Passage. Also beach Geraldton, W.A. (Type locality—Glenelg, shell sand.)

O. taylorae sp. nov. Pl. 1, fig. 9. "Taylor's Odostomia." Elongated ovate, rather solid; light horn color, the protocouch and one or more following whorls blackish; axial growth striae, minute, valid; no spirals; protoconch sinistral, slightly oblique, rather depressed, of one and-a-half turns; adult whorls five, nearly flat; suture well marked; mouth ovate; outer lip convex, effuse anteriorly; columella with one nearly horizontal fold; no spiral striae in the throat. Type—Height 4, diam. 2.5 mm. Beach—Venus Bay, S. Aus. (Reg. no. D10628 S.A. Mus.) Also taken beach—Smoky Bay, Tourville Bay, Murat Bay; not uncommon. The dead shell is usually light horn coloured as in the type, but living specimens usually have some or all of the whorls brown, blackish, or blackish-blue. Allied to *O. deplexa* Hedley, and differs in that the shell is narrower, spire longer, protoconch comparatively larger, mouth longer and narrower, lip more effuse anteriorly. Named after Miss Violet Taylor,

an enthusiastic collector tutored by the late Mr. E. H. Matthews, and a foundation member of the Shell Club 1925, now the Malacological Society of South Australia.

O. compta Brazier 1877. "The Adorned Odostomia." Elongated, very thin, transparent; white; smooth, spire much lengthened; whorls eight, slightly convex, last minutely keeled in the centre, angulated at the sutures; sutures channelled; mouth ovate, produced anteriorly; peristome thin, acute, interior of mouth near the edge granulated, furnished well down with nine narrow, minute raised lines of striae, interstices broad, minutely granulated; columella with strong, thick, transverse spiral fold. Height 5, diam. 2 mm. Very rare. Beach—Gulf St. Vincent. Also beach—King George Sound, W.A. (Type locality—Darnley Island, Torres Straits, 20-30 fathoms, sandy bottom. Like *O. simplex* Angas, but differs by being keeled. According to Hedley, the following shells from Darnley Island and Cape Yorke are slight variation of one form—*O. affinis*, Brazier, *O. compta* Brazier, *O. polita* Brazier, *O. parvula* Brazier (not *O. polita* Bivona and not Pease).

Turbonilla Risso 1826 (=*Chemnitzia* D'Orbigny 1839: = *Pyrgiscus* Phillipi, 1841: = *Euturbonilla* Semper 1861). Slender, elongated; mostly axially ribbed or spirally striate; protoconch sinistral; adult whorls many, dextral, and but slightly convex; mouth simple, oval or subquadrangular, peristome not continuous; outer lip thin; columella vertical, either without folds or with a single small obscure fold; operculum horny, subspiral, margin next the columella entire, face with a spiral groove. Type—*T. elegantissima* Macgregor. Distinguished from *Odostomia* by the elongated form, usually axially ribbed, and the columella with, at most, a very obscure fold. *Turbonilla* comprises a great number of small, graceful white shells, which have been grouped in a number of genera and subgenera. Some new species in the South Australian Museum will be described at a later date.

T. aciculalis A. Adams 1853. Pl. 1, fig. 10. (=*T. macleayana* Tenison-Woods, 1876). "The Needle-like Turbonilla." Extremely attenuate, turreted, rather solid, shining; white; axial ribs, oblique, eleven to fourteen in the last whorl, smooth, raised, rounded, reaching from suture to suture; whorls fifteen, flattened; suture well impressed; mouth quadrate; columella straight, obliquely plicate. Height 10, diam. 1.5 mm. Beach—Corney Point, Hardwicke Bay, uncommon. Dredged—Backstairs Passage, Gulf St. Vincent, five fathoms. (Type locality—*aciculalis*,

Loay Island, Bohol, sixty fathoms in clayey sand; *macleayana*, Long Bay, Tasmania). A small acicular species with the ribs wide apart and the interstices plain. Distinguished by the very slender, turreted habit.

T. beddomei Petterd 1884 (*Chemnitzia*) (= *T. scalarina*

Brazier 1894: = *T. crenulifera* Tate 1892). "Beddome's Turbonilla." Elongately turreted, shining; milky-white, opaque; axial ribs, small, the interstices equalling the ribs in width; ribs obsolete at base of last whorl; whorls eight rounded; suture very much impressed; mouth oval; outer lip thin. Height 5, diam. 1.5 mm. General, all round the South Australian coast, but not common, beach and down to 55 fathoms. (Type locality—North West Coast, Tasmania). Some taken alive are purple stained.

T. brevis Pritchard & Gatliff 1900 "The Short Turbonilla."

Very small, pupaeform; white; axial riblets, fine, close, about sixteen to twenty, with fine spiral threads in the interstices, giving rise to a clathrate ornament; the sculpture not always well marked on the body whorl; protoconch sinistral, smooth, of one-and-a-half turns, with immersed tip; adult whorls four or five, flattish or slightly convex, very gradually increasing in size; suture is well and somewhat suddenly impressed, imparting to the whorls a rather more convex appearance at the suture; mouth oval; outer lip thin, and after ascending descends slightly before joining the penultimate whorl. Height 2, diam. .75 mm. Beach—Port Willunga, Wauraltie, Streaky Bay, Fowler Bay, uncommon; dredged—Gulf St. Vincent, Cape Borda down to 55 fathoms. (Type locality—Rhyl, Phillip Island, Western Port, Victoria, from shell sand dredged from about 4 fathoms). Appears most like *T. scalarina* Brazier a Sydney shell, but is apparently more robust for its size, of fewer whorls, with distinct ornament in the interstices, and with more numerous ribs which run straighter up the shell. Shells in the S.A. Museum identified as *T. brevis* indicate that the protoconch is usually nearly horizontal, but some, apparently the same species, have the protoconch immersed.

T. hofmani Angas 1877 (= *T. nitida* Angas 1867, preocc.)

"Hofman's Turbonilla." Sharply tapering, turreted, rather thin, shining; white; axial ribs, prominent, rather broad, interstices smooth, narrow; ribs abruptly ceasing at the periphery of last whorl; whorls thirteen, slightly convex; sutures impressed; mouth small, subquadrate; outer lip thin, a little produced below; columella straight. Height 10, diam. 2 mm. Beach, Harwicke Bay, not common. Dredged, Rapid Head, Yankalilla Bay, Gulf St. Vincent, Backstairs Passage, Investigator Strait, Middleton, to

17 fathoms. (Type locality—Port Jackson N.S.W., dredged). May consider this to be a variety of *T. mariae* Tenison-Woods. *T. hofmani* is very variable; form (a) is smaller, narrower, thinner, translucent between the ribs, with a translucent band in each spire whorl, and another just above the suture, and about half-a-dozen translucent hair lines; there may be up to three narrow brown spirals in the whorls, and a wider one in the base of the body-whorl; the intercostals smooth or faintly spirally striate. Form (b) more slender, with eight to twelve well marked spiral incisions at about equal distances, except between the middle two where the space is wider; four to six spiral incisions on the base; in some the interspaces between the ribs cease abruptly at the periphery, in others the ribs and interspaces are bounded just above the suture by a smooth spiral band; rarely this form is pink, and some have brown bands.

T. mariae Tenison-Woods 1876. "Marie's Turbonilla." Elongated, cylindrical, turreted, somewhat solid; milky-white, opaque; axial ribs, numerous, thick, sloping, rounded interstices small, inconspicuous, as wide as the ribs; ribs on last whorl scarcely obsolete at the periphery; whorls twelve, flatly convex; base smooth shining, convex; mouth oval, angulated above, produced and inverted below. Height 10, diam. 2 mm. Beach, Venus Bay, Macdonnell Bay, Robe, rather uncommon. (Type locality—King Island, Bass' Straits).

T. portseaensis Gatliff & Gabriel 1911. "The Portsea Turbonilla." Elongated, solid; milky-white; axial ribs, about twenty-two on the penultimate whorl, prominent, shining, just project at the shoulder and continue to the base, where they cross a faint carination, gradually vanishing as they approach the columella; interstices deep, as wide as the ribs; spiral striations, close, uniform, interstitial, more numerous on body-whorl and base than on the spire whorls; protoconch sinistral of two turns; adult whorls seven, rounded, slightly shouldered; suture well defined; mouth ovate; inner lip slightly reflected. Height 4.5, diam. 1.5 mm. Beach—St. Francis Island, Smoky Bay, Venus Bay, Robe, MacDonnell Bay, uncommon. Also King George Sound, W.A. (Type locality—Portsea, Victoria). A graceful form, milky-white colour and ornate sculpture. The interstitial striation serves as a useful recognition mark, and in this respect somewhat recalls *Odostomia pupaeformis* Sowerby. It is axially costated to the base and the suture is not channelled.

T. varicifera Tate 1898. "The Variced Turbonilla." Elongate, turreted; chestnut-brown, the varices mottled with white, or various shades passing to white occur; axial ribs, close-set,

slightly oblique, rounded, wider than the interspaces, here and there two or more ribs are confluent to form a broad varix; last whorl with about twenty axial ribs, evanescent at the regularly rounded periphery; spiral lines, about fifteen on the penultimate whorl, cross the axials; base spirally linear-sulcate; whorls twelve, flatly convex; suture well defined; mouth oblong; columella with an obscure fold. Height 15, diam. 4 mm. Dredged generally, but rare. (Type locality—Gulf St. Vincent, deep water). Variable—form (a) has varices on the body whorl and base but not on the spire whorl; the ribs end on a prominent peripheral spiral lira; there is no peripheral angulation; the spiral incisions are wider and form broad spiral rounded lirae; the shell may be purple brown or quite white. Form (b) is narrower than the species, has no varices, no angle, no sudden cessation of costae. Form (c) is variced, angled, and the ribs suddenly cease.

T. admiranda Tate & May 1900 (= *Elusa bifasciata* Tenison-Woods 1877: = *T. festiva* Angas 1877. "The Turbonilla worthy of admiration." Turreted-tapering, translucent, shining; the whorls are one-half white and one-half chestnut, with a line of deep colouring on the boundary; on the last whorl the band of colour is bordered by two darker lines; axial ribs numerous, rounded, twenty-six in the last whorl; mouth ovate; columella with one fold. Height 7, diam. 1.5 mm. Beach, general in shell sand, rather uncommon. Also beach, King George Sound, W.A. (Type locality—Blackman's Bay, Tasmania).

T. fusca Adams 1853 (*Chemnitzia*) (= *T. erubescens* Tate 1879). "The Reddish-brown Turbonilla." Turreted lanceolate, shining; reddish-brown; axial ribs numerous, smooth, as wide as the interspaces which show numerous spiral incisions; whorls numerous, rounded, subangulated above; suture deep; mouth subquadrate; columella with one oblique fold. Height 6, diam. 1.2 mm. Beach, general, uncommon. Dredged to 55 fathoms. (Type locality—Port Lincoln). A small shining red brown species with convex whorls and numerous thin ribs. A variant has a spiral groove just before the suture, crossed by the axial costae, and fewer spiral threads; dredged Cape Borda, 55 fathoms.

Oscilla A Adams 1867. Solid, ovate or pyramidal turreted, imperforate; whorls strongly spirally lirate; mouth oval or subquadrate, with a strong, transverse, median parietal plication. Type—*P. (Pyramidella) annulata* A. Adams (Philippines).

O. tasmanica Tenison-Woods 1876 (*Parthenia*) (= *O. ligata* Angas 1877). Pl. 1, fig. 21. "The Tasmanian Oscilla." Minute, pyramidal, tumid, tricarinate, subumbilicate; rosy white

in life; axially faintly striate; protoconch subtumid; adult whorls six, conspicuously tricarinate. flat, carinae raised, rounded; base subconvex, lirate; mouth pyriform, entire; inner lip reflexed, with a very distinct transverse tooth-like fold. Height 2.5, diam. 1 mm. Streaky Bay. (Type locality—Long Bay, Tasmania, dredged). A minute three-keeled shell, upper and lower keels so closely united as to appear one broad keel in which the suture is concealed.

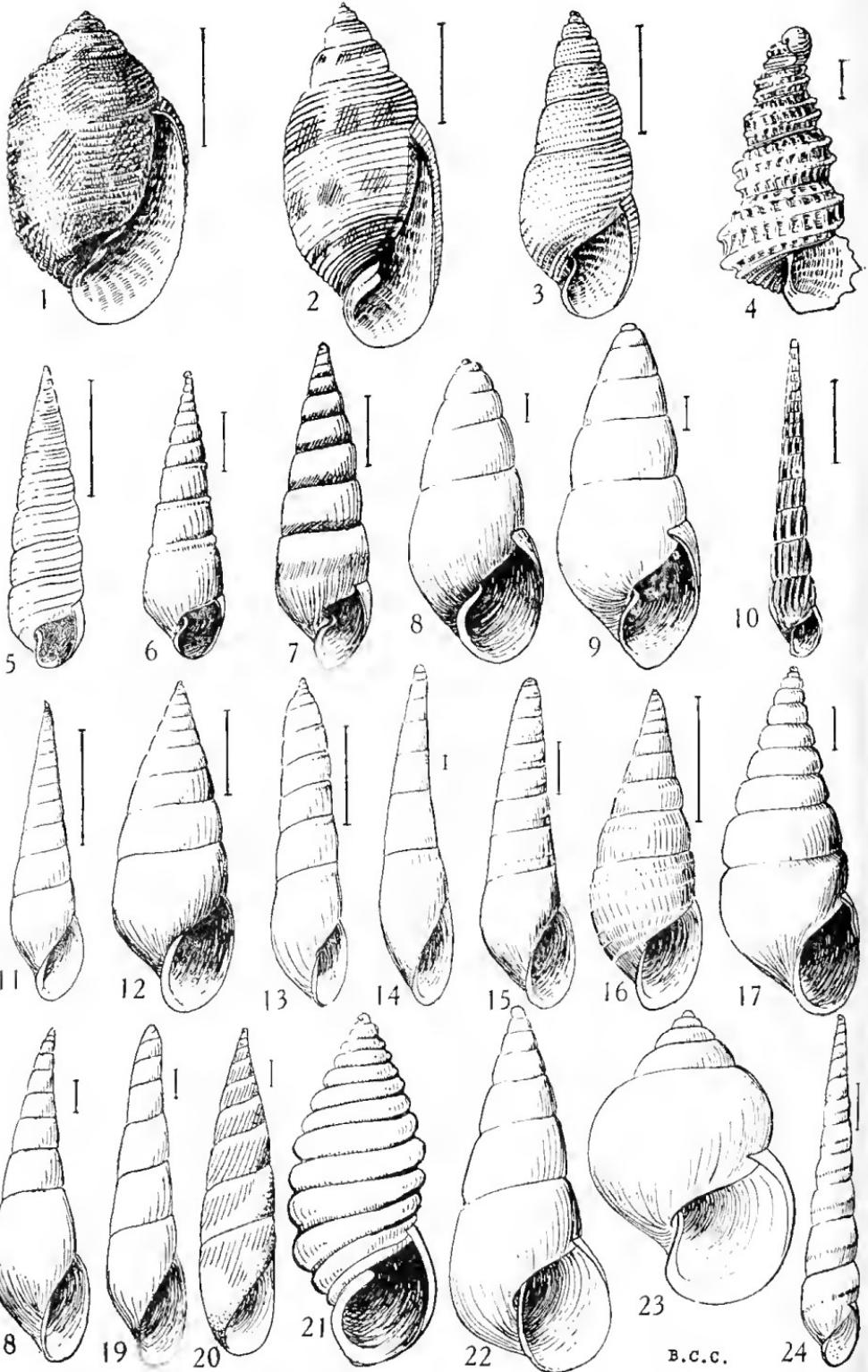
STROMBIFORMIDAE.

Small, generally elongated, tapering or turriculate, shining, polished, spire sometimes curved; mouth oval or pyriform, entire, lip simple, columellar margin more or less thickened; operculum horny, paucispiral, sometimes absent. Distribution—Tropical and Temperate. Fossil—Jurassic. Animal with slender tapering tentacles and eyes sessile at their outer bases; proboscis retractile, invaginate, when extended very long; mouth without jaw or radula; foot elongated, produced in front; mantle with anterior rudimentary siphonal fold. They creep with the foot much in advance of the head, which is usually concealed within the mouth of the shell, the tentacles only protuding. More or less parasitic on sea-urchins, holothurians. Sexes probably distinct.

Eulima Risso 1826. Jeffreys refers to the name *Eulima* as a compound of a Greek and a Latin word, signifying finely polished; Woodward gives it as from *eulimia*, ravenous hunger. Awl-shaped, polished, shining like porcelain; not umbilicate; spire finely tapering to a regular point and slightly twisted to one side; whorls many; suture slight; varices slight externally, but forming small ribs within, marking the position of successive months; mouth ovate, entire, angulate above and rounded below; columellar border reflected; operculum horny, paucispiral, nucleus near the inner lip. Type—*E. polita* Linne (British Isles) = *Eulima elegantissima* Montag.

E. augur Angas 1865 (= *E. proxima* Sowerby: = *E. aphelles* Tenison-Woods 1878: = *E. marginata* Tenison-Woods 1878). "The Augur Eulima." Rather narrow, solid; white, opaque; smooth; spire very slightly curved; the old mouths not uniformly along one side, there may be a variation of a quarter of a whorl either way; protoconch blunt, of two scarcely convex whorls, slightly oblique; the protoconch is usually missing and dredged examples show the irregular fracture where it has broken away; shore specimens have the posterior end blunt from beach rolling; adult whorls eight, early whorls more or less convex, later whorls rather flattened; periphery of body-whorl rounded; suture margined; mouth suboval; outer lip sinuous above; columella straight.

WICCE



B.C.C.

PLATE I.

- Fig. 1—*Acteon areatus* Verco.
Fig. 2—*Pupa intermedia* Angas.
Fig. 3—*Leucotina concinna* Adams.
Fig. 4—*Opimilda decorata* Healey.
Fig. 5—*Cingulina spina* Crosse & Fischer.
Fig. 6—*Syrnola unisulcata* sp. nov.
Fig. 7—*Syrnola elliotae* sp. nov.
Fig. 8—*Odostomia deplexa* Tate & May.
Fig. 9—*Odostomia taylorae* sp. nov.
Fig. 10—*Turbonilla acicularis* Adams.
Fig. 11—*Eulima roegerae* sp. nov.
Fig. 12—*Eulima murrayae* sp. nov.
Fig. 13—*Eulima georgiiregis* sp. nov.
Fig. 14—*Eulima edwardsi* sp. nov.
Fig. 15—*Eulima traggi* sp. nov.
Fig. 16—*Eulima planicincta* sp. nov.
Fig. 17—*Eulima gradata* sp. nov.
Fig. 18—*Melanella petterdi* Beddome.
Fig. 19—*Strombiformis broadbentae* sp. nov.
Fig. 20—*Strombiformis williamsi* sp. nov.
Fig. 21—*Oscilla tasmanica* Tenison-Woods.
Fig. 22—*Pseudorissoides tasmanica* Tenison-Woods.
Fig. 23—*Stilifer brazieri* Angas.
Fig. 24—*Eulimella plunketti* sp. nov.

Height 11, diam. 3.5 mm. Rather common, beach, all along the South Australian coast; dredged Gulf St. Vincent and Spencer Gulf, to 22 fathoms. Also Western Australia, Esperance, Hopetown, King George Sound, Ellensbrook, Bunbury, beach and down to 35 fathoms. (Type locality—South Australia).

E. commensalis Tate 1898. "The Commensal Eulima."

Elongate-pyramidal, strongly curved in two directions, translucent, glassy; fawn-coloured with contained animal; smooth; whorls ten, moderately convex; body-whorl globosely inflated, thence tapering to the very acute protoconch; mouth semi-circular; outer lip much curved medially; front of mouth well rounded, but the margin slightly reflected, so that seen from behind there is the semblance of basal constriction. Height 5, diam. 2 mm. Generally distributed, from Beachport S.A. to Ellensbrook W.A., beach and down to 100 fathoms, commensal on the long spires of certain sea-urchins. (Type locality—Holdfast Bay and Aldinga Bay, commensal with certain species of *Amblypneustes*, a genus of rather long-spined sea-urchins). Mouth like that of *E. tenisoni* Tryon, but protoconch very acute (not mamillate), shell much narrower.

E. inflata Tate & May 1900. "The Inflated Eulima."

Whorls slightly irregularly convex; penultimate whorl somewhat contracted; last whorl much inflated, regularly convex; mouth small, roundly oval, hardly oblique; outer lip not retreating at the sutural margin. Height (without protoconch) 6.25, diam. 3 mm. Rare, Beachport S.A. to Rottnest Island, W.A., beach and down to 110 fathoms. (Type locality—North coast of Tasmania). Resembles *E. tryoni* Tate & May, but thinner and longer for the same number of whorls—whorls more convex; *tryoni* has a more oblique mouth, narrower base, which is oblique on the left side. South Australian specimens are a little longer and narrower than the type.

E. mayi Tate 1900. "May's Eulima." Solid, highly polished; white; spire with a slight apical twist from before backward, gradually tapering to an extremely attenuated tip; whorls fourteen, flat; mouth elongate oval, a little higher than wide, slightly oblique; outer lip retreating from the middle line to the suture. Height 7.75, diam. 2.5 mm. Gulf St. Vincent S.A. to King George Sound W.A., beach and down to 35 fathoms. (Type locality—East coast of Tasmania, south of Swansea). Resembles *E. intermedia*, but the last whorl approximately half the length of shell, instead of one third, as in that Mediterranean species. South Australian specimens are narrower and smaller—the type of *E. mayi* appears to be unique.

E. mucronata Sowerby 1866. "The Sharp-Pointed Eulima." Cylindrical, narrow, transparent; smooth; protoconch sharp pointed, of three turns; adult whorls seven, flat, the first suddenly swelling out from the mucronate protoconch; last whorl oblong; suture marginated; mouth scarcely pyriform, rounded below; outer lip thin; columella oblique, slightly tortuous. Height 10, diam. 2.5 mm. Beach, Grange, American River, Fowlers Bay. Also W.A., King George Sound, beach and down to 28 fathoms. (Type locality—Port Jackson, N.S.W.)

E. expansilabra May 1910. "The Expanded-lip Eulima." Tapering, slightly bent; white; smooth; protoconch minute; adult whorls about seven, rounded, increasing rapidly; body whorl inflated; suture well impressed; mouth large, angled above and below; outer lip roundly expanded; columella rather straight, well reflexed. Height 3.5, diam. 1.5 mm. Rare, dredged—Neptune Islands, Cape Jaffa, Beachport, 104-300 fathoms. (Type locality—From 100 Fathoms, seven miles east of Cape Pillar, Tasmania; also from 40 and 80 fathoms, east of Schouten Island, Tasmania). Remarkable for its small spire, large body whorl, and widely expanded mouth. May in his Check List gives this as a synonym of *E. munita* Hedley, but that has the mouth rounder and more effuse.

E. orthopleura Tate 1898. "The Straight-sided Eulima." Pyramidal, straight, shining; opaque-white; whorls nine, flat; last whorl subangular at the periphery; mouth rhomboidal. Height 6.25, diam. 2.25 mm. Not uncommon. Beach, Gulf St. Vincent and westward to Bunbury, W.A. (Type locality—Holdfast and Aldinga Bay) The rhomboidal mouth differentiates it from *E. augur*, and in addition it is distinguishable from the latter by a subangular base. May be only a variety of *E. augur* Angas.

E. tryoni Tate & May 1900 (= *E. micans* Tenison-Woods 1875 preocc. Carpenter). "Tryon's Eulima." Minute, obtusely turreted, slightly curved, polished; whitish; extremely smooth; protoconch mamillated; adult whorls about five, flattened above, penultimate rounded, last subinflated; mouth pyriform; outer lip thin, produced; inner lip reflected. Height 3, diam. 1.5 mm. Uncommon. Gulf St. Vincent, west to Rottnest Island W.A., beach to 104 fathoms. (Type locality—Long Bay, Tasmania). A very highly polished translucent Eulima. The mamillated protoconch distinguishes it from *E. tenisoni* Tryon 1886 which is almost mucronate.

E. tenisoni Tryon 1886. "Tenison-Woods Eulima." The shell figured by Tryon is sharp pointed and is a different species from *E. tryoni* Tate & May. It is related to *E. latipes* Watson, which has a broader base, patulous outer lip, and has a somewhat rapid increase of growth of the spire. Height 3, diam. 1.3 mm. Not uncommon in shell sand all along the coast, from Beachport S.A. to Hopetown W.A., and dredged to 130 fathoms. (Type locality—Tasmania). This shell is very much like *E. tryoni* but without the blunt (almost mamillated) protoconch. It seems to vary a good deal in its obesity, some being much narrower than others; some are more or less horn coloured, some white, others partly bluish-brwn; some are nearly straight, others distinctly curved in two directions, lateral and vertical. When alive, they are somewhat translucent.

E. topaziaca Hedley 1908. Minute, narrowly ovate, polished, semitransparent; white or brown with a marked subsutural translucent band, due to callus at the back of the mouth; microscopic accremental and spiral striae; protoconch dextral, rather obtuse; adult whorls about four, rapidly increasing, oblique, sloping, contracted at the suture; columella and base of each spire whorl visible through the shell; mouth pyriform, rounded and slightly effuse below, contracted and angled above where it tends to separate from the body whorl; outer lip simple; columella reflexed, narrow. Height 2.55, diam. 1.25 mm. Dredged—Cape Borda, 55 fathoms. (Type locality—Middle Harbour, Sydney). The shape of this excentric *Eulima* is like that of *Rissoa*.

E. expansilabra May 1910. "The Expanded-lip Eulima." Tapering, slightly bent; white; smooth; protoconch minute; adult whorls about seven, rounded, increasing rapidly; body whorl inflated; suture well impressed; mouth large, angled above and below; outer lip roundly expanded; columella rather straight, well reflexed. Height 3.5, diam. 1.5 mm. Beachport to Neptune Islands, beach to 300 fathoms. (Type locality—Seven miles east of Cape Pillar, Tasmania, 100 fathoms), also from Schouten Island, Tasmania, 40 and 80 fathoms. Remarkable for its small spire, large body whorl, and widely expanded mouth. Approaches *E. minuta* Hedley (from N.S.W. and Tas.), but mouth is rounder and more effuse. May in his Check List gives *expansilibra* as a synonym of *minuta*.

E. cuneiformis May 1915. "The Wedge-shaped Eulima" (probable interpretation). Narrowly pyramidal, slightly curved, highly polished; yellowish-white; smooth; protoconch obtuse; adult whorls seven, slightly rounded, base of the preceding whorl

showing clearly through the shell; body whorl tumidly developed; suture distinct; mouth pyriform, small, umbilical area broadly excavate. Height 4, diam. 1.5 mm. Uncommon. Gulf St. Vincent. (Type locality—50 fathoms, off Maria Island, Tasmania) A species without any marked characters; much narrower than *E. tenisoni* and the mouth is rather more elongate and less inflated; both this and *E. tenisoni* have an outer lip retreating in the upper part. It has a different mouth from *E. indiscreta*, and in this it comes very close to *E. commensalis* which has a more acute protoconch. Tasmanian specimens are generally straighter and larger than ours.

E. fricata Hedley 1907. "The Smoothed Eulima." Subcylindrical, scarcely tapering, blunt at either end; apical whorls white, opaque, lower semitransparent, permitting the axis to be clearly seen through the wall; smooth; protoconch dome-shaped; adult whorls five; suture, above scarcely distinguishable; below linear; mouth regularly pyriform, a slight callus on the columella. Height 4.25, diam. 1.15 mm. Dredged—Cape Borda, also St. Francis Island, 35-55 fathoms. (Type locality—80 fathoms, off Narrabeen, N.S.W.). Allied to *E. paxillus* Hedley 1904, from which it differs by being nearly twice as large and by having a longer, narrower aperture.

E. roegerae sp. nov. Pl. I, fig. 11. "Roeger's Eulima." Elongate, pyramidal, solid, shining; opaque white; smooth, except for exceedingly fine lines of growth; protoconch small, oblique, of two turns, smooth; adult whorls eleven, very slightly convex, last rather small; base smooth; suture narrow, margined, not impressed; mouth pyriform; outer lip acute, a little produced anteriorly; inner lip reflexed, narrow. Type—Height 14, diam. 3.5 mm.—55 fathoms, off Cape Borda, S. Aust., (Sir J. C. Verco). (Reg. No. D10629 S. Aus. Mus.). Distribution, beach—Holdfast Bay, Fowlers Bay, also dredged—Beachport, 110 fathoms, Neptune Islands, 45 fathoms. Nearest ally, *E. augur* Angas, but differs in being much narrower (*augur* is 11 x 3.5 typically), with whorls slightly convex; protoconch similar to that of *augur*, and usually missing; base smooth, and not marked with the four equidistant spiral lines as in *E. apheles* Tenison-Woods, a synonym of *E. augur*. Named after Miss M. Roeger, an untiring Naturalist and indefatigable Officer of the Field Naturalists' Section of the Royal Society of South Australia; a foundation member of the Shell Club, as also of its successor, the Malacological Society of S.A.

E. murrayae sp. nov. Pl. 1, fig. 12. "Murray's Eulima." Rather broad, convex sided, an dshort for the genus, solid, shining, polished; opaque white; smooth except for extremely fine lines of growth; protoconch of two turns, slightly convex, rather long, smooth; adult whorls nine, slightly convex; base smooth; suture narrow, not impressed; mouth moderately elongate ovate; outer lip acute, a little produced anteriorly; inner lip reflexed, narrow. Type—Height 10.4, diam. 3.8 mm. Gulf St. Vincent, 10 fathoms. (Reg. No. D10630 S. Aus. Mus.). Distribution, Gulf St. Vincent to Western Australia, beach and down to 55 fathoms. From *E. augur* Angas, it is rather more corpulent, the shorter spire whorls become at once much more convex, and because of their rather rapid increase, the protoconch has a somewhat papillary appearance. The mouth differs from that of *E. inflata* Tate & May in being more oval, and longer vertically. The protoconch is like that of *E. augur* Angas. The species is named after Miss J. M. Murray, a foundation member of the Shell Club, and of its successor, the Malacological Society of South Australia; an able artist whose figures of our shells have been reproduced in earlier issues of the S.A. Naturalist.

E. traggi sp. nov. Pl. 1, fig. 15. "Trigg's Eulima." Elongate, straight sided, solid, slightly curved, hightly polished; translucent-white, tinged with chestnut-brown; a single well defined suprasutural spiral striation in each spire whorl at about one third the height of the whorl fro mthe lower suture; no spiral on the body whorl; protoconch white, obtuse, of two turns, rather flat topped, small; adult whorls eight, nearly flat, slowly increasing; suture linear; mouth narrowly elongate-ovate; outer lip thin; inner lip reflexed anteriorly; varices visible all up one side. Type—Height 6.4, diam. 1.7 mm. Cape Jaffa S.A., 90 fathoms. (Reg. No. D10633 S; Aus. Mus.). Distribution—Beachport, S.A., to Bunbury, W.A., beach and down to 150 fathoms. Superficially resembles *Melanella petterdi* Beddome, but is much straighter, protoconch blunter, spire whorls do not increase so rapidly. Named after Mr. F. Trigg, foundation Secretary of Shell Club and subsequently Vice-Chairman of the Malacological Society of South Australia, and a most enthusiastic shell collector and student.

E. gradata sp. nov. Pl. 1, fig. 17. "The Gradated Eulima." Broad, sharply tapering, very thick, solid, very slightly curved, comparatively short and stout, shining, polished; opaque white; smooth; protoconch small, depressed, of two turns, rounded, flat topped; adult whorls nine, early ones flat, the penultimate becoming slightly convex, all the spire whorls flattened horizon-

tally at the sutures, giving the whorls a bulbous appearance; actual suture linear; mouth rather widely elongate ovate; outer lip slightly excavated just below the suture; inner lip slightly concave. Type—Height 5, diam. 2 mm. Ellensbrook W.A., in shell sand. (Reg. No. D10634 S. Aus. Mus.). Also beach—St. Francis Island. A distinct species, somewhat like *E. murrayae* Cotton & Godfrey, in general proportion and appearance; but distinguished from that and other congeners by its great solidity, gradate and bulbous whorls.

E. edwardsi sp. nov. Pl. 1, fig. 14. "Edward's Eulima." Minute, thin, elongated, five times as long as wide, nearly straight, translucent; dull white; smooth, except for extremely fine lines of growth; protoconch eroded, of two turns, rather flat topped; adult whorls six, flat; last whorl somewhat longer than the spire, slightly, gradually constricted below the suture; suture linear; mouth very long, narrow. Type—Height 1.5, diam. .3 mm. (unique). 55 fathoms, off Cape Borda. (Reg. No. D10632 S. Aus. Mus.). The type is slightly curved to the right, so the apertural side is very slightly concave. Quite distinct from anything examined. Named after Mr. R. S. Edwards, an enthusiastic collector and member of the Malacological Society of South Australia.

E. georgiiregis sp. nov. Pl. 1, fig. 13. "The King-George-Sound Eulima." Thin, translucent, delicate, very gradually tapering for the lower seven whorls, then suddenly tapering to an elongate, minute, smooth, round-whorled, white protoconch; adult whorls very slightly convex, and very slightly constricted just below the suture, beneath which constriction the shell is faintly stained, irregularly with brown. Type—Height 12, diam. 2.8 mm. King George Sound, 22-28 fathoms. (Reg. No. D10631 S. Aus. Mus.). Also Gulf St. Vincent, beach, and dredged. Closely related to *E. mucronata* Sowerby, but less cylindrical, and less constricted below the sutures.

E. planicincta sp. nov. Pl. 1, fig. 16. "The Flat-ringed Eulima." Elongate, pyramidal, scarcely fusiform; dull white; surface not smooth, but with narrow flat spiral areas, which extend, in the body whorl, over the base; no mouth scars visible; protoconch minute, smooth, round whorled; adult whorls nine, slightly convex; mouth pyriform; outerlip simple; columella slightly concave. Type—Height 15, diam. 5 mm. Gulf St. Vincent, 10 fathoms. (Reg. No. D10635 S. Aus. Mus.). Also King George Sound W.A., 22 fathoms. Shape recalls *E. augur* Angas, but is a little broader; protoconch similar, the outer lip less sinuous at the back. The narrow flat-ringed areas constitute the distinguishing feature.

Melanella Bowdich 1822. Longitudinally volute; the last whorl considerably larger than the preceding; turreted, spire curved; semitransparent mouth invaded by the last whorl. Type—*M. dufresnii* Bowdich.

M. petterdi Beddoe 1882 (*Eulima*) (= *E. indiscreta* Tate 1898). Pl. 1, fig. 17. "Petterd's Melanella." Elongate-pyramidal, curved, translucent, vitreous; white; smooth; protoconch rounded at the apex, small; adult whorls about nine, nearly flat; base convex and attenuate below; mouth narrowly pyriform; outer lip scarcely reflected; columella straight. Height 4, diam. 1 mm. Beachport S.A. to Bunbury W.A., beach and down to 150 fathoms. (Type locality—Blackman's Bay, Tasmania). Rather variable. South Australian specimens are generally a little more attenuate than the type; length of body whorl varies in proportion to total length; the twist on the shell varies, in some it is in one plane, in others it is a screw curve, due to the lip mark on the spire being carried successively a little farther on than the previous one. In Tasmanian specimens the last whorl bears a smaller proportion to the spire than in the South Australian shell.

Strombiformis Da Costa 1778 (= *Leiostraca* H. & A. Adams 1854). "Needle-shaped Shells" from *Strombus*, a needle. Very long, slender, tapering to a sharp point; whorls flattened, smooth, polished, often with spiral coloured bands; varices slight, on each side of the spire but not always apparent; mouth oblong, narrow, entire; inner lip thickened, a little sinuous in the middle; outer lip sharp, flexuous. Type—*Strombiformis glaber* Da Costa (England).

S. joshuana Gatliff & Gabriel 1910 (*Leiostraca*). "Joshua's Needle Shell." Minute, fusiform, glassy, sufficiently translucent to discern the axial pillar through the whorls; interrupted, zig-zag, orange coloured markings on three last whorls; smooth; protoconch a trifle more vitreous than the rest; adult whorls about six, rather flat, without varices; sutures not impressed, merely define the whorls; mouth pyriform, effuse below; outer lip thin, with a callus on the body whorl; columella slightly excavated. Height 3, diam. 1 mm. Beachport S.A. to Bunbury W.A., beach, and down to 90 fathoms; alive in five fathoms, Gulf St. Vincent. (Type locality—San Remo, Victoria). Tate confused South Australian specimens under various names, with *S. bivittata* Reeve; the columella margin is prominent and runs forward as a sharp edge, while the columella of *joshuana* is flat and slightly concave as in *Thais*; the mouth also is different. *S. acutissimus* Sowerby is scarcely fusiform, narrower, no zig-zag markings.

S. acutissimus Swerby 1866 (*Leiostraca*) (= *L. lesbia* Angus 1871). "The Very Acute Needle Shell." Scarcely fusiform, acuminate, tapering, very thin; pellucid, white; smooth; whorls eight, slightly inflated, the last large; mouth narrow; columella long, rather straight. Height 3, diam. .8 mm. Gulf St. Vincent S.A. to Bunbury W.A., beach and down to 35 fathoms (Type locality—Sydney [Reeve]).

S. perexiguus Tate & May 1900 (= *Rissoia minutissima* Tenison-Woods 1878, not of Michelin). "The Very Scant Needle Shell." Minute, pyramidal, polished; yellowish-white, except the livid protoconch; without ornament of any kind; protoconch obtuse; adult whorls four, slightly convex; mouth somewhat oval, channelled above; outer lip sharp, produced; inner lip reflexed. Height 1.5, diam. .75 mm. Beachport to Cape Borda, beach to 55 fathoms. Rare. (Type locality—Blackman's Bay, Tasmania).

S. bivittata Reeve 1866 (*Leisostraca*) (= *Eulima bilineata* Adams & Reeve, preocc.). "The Two-banded Needle Shell." Elongated, attenuate; pale, with two linear, approximate, spiral chestnut bands in the middle of the whorls; whorls nine, straight, moderately oblong; mouth narrow, pyriform. Height 10, diam. 1.8 mm. Beachport S.A., to King George Sound WA., beach and down to 104 fathoms. (Type locality unknown. *E. bilineata* was described as from Looloo Sea). South Australian specimens have, in addition to the two brown lines in the last whorl, a brown spot tending to a line further forward; the columella and margin of the outer lip also brown; some are destitute of colour, perhaps from bleaching, and the brown margin of previous labra are seen as curved axial brown lines at intervals on the spire; these are not found uniformly on both sides of the shell, but three-fourths round the shell, then one-fourth round, then five-sixths, then three-fourths, so that no regular series is formed.

S. williamsi sp. nov. Pl. 1, fig. 20. "Williams' Needle Shell." Small, elongated, slender, sides of shell slightly convex, apical whorls slightly bent, shining, polished; white, marbled with brown, except for a pure white band beneath the suture; protoconch minute, slightly mucronate; adult whorls nine, somewhat rounded; mouth pyriform; outer lip thin, almost straight at the side, rounded and slightly effuse at the base; columella slanting, almost straight. Type—Height 7, diam. 1.4 mm.—Gulf St. Vincent, 10 fathoms. (Reg No. D10637 S. Aus. Mus.). Related to *S. bivittatus* Reeve, but shorter, rather stouter, early whorls slightly bent, mouth not so long, not so effuse in front, agate marbling. From *S. lodderae* Hedley, it is stouter, more

fusiform, protoconch sharper and slightly mucronate, colouration different, it also has visible varices. Named after Mr. H. Williamis, an enthusiastic member of the Malacological Society of South Australia.

S. broadbentae sp. nov. Pl. 1, fig. 19. "Broadbent's Needle Shell." Subcylindrical, slightly curved, minute, very slender, five times as long as wide, thin, translucent; protoconch, one-and-a-half whorls, small, flat topped, opaque white; adult whorls six, flat; mouth elongated, narrow; outer lip convex; inner lip slightly reflexed, suberect. Type—Height 3.5, diam. .7 mm.—55 fathoms N.W. of Cape Borda S.A. (Reg. No. D10636 S. Aus. Mus.). Also Rottnest Island, W.A. Closely related to *S. acutissimus* Sowerby, but much smaller, more delicate, more translucent, and whorls less rapidly increasing. Named after Mrs. W. Broadbent, a keen member of the Malacological Society of South Australia.

Eulimella Jeffreys 1847. Elongated, subcylindrical, turriculate, rather solid, smooth, polished; whorls numerous, protoconch sinistral; mouth subquadrangular or suboval; peristome discontinuous; columella straight, without folds; operculum semi-circular, horny, subspiral, nucleus at lower end, with a spiral groove, columellar margin entire. Type—*E. gracilis* Jeffreys 1847 (Europe).

E. moniliformis Hedley & Musson 1891. "The Collar-shaped Eulimella." Minute, thin, transparent, acicular, conical; glossy white; axial striae, fine, crossed by faint microscopic spiral scratches; spire long, tapering slowly; protoconch small, discoidal, sinistral, half turned over; adult whorls seven, rounded, increasing slowly, last whorl two-thirds of total length; suture margined deeply impressed; mouth long, pear-shaped, rounded below and acute above; outer lip sharp; inner lip thick, straight, reflected anteriorly over a minute rimation. Height 3, diam. 1 mm. Rare, although generally distributed in South Australia. (Type locality—Manly Lagoon, near Sydney, entangled in masses of flannel-weed [*Spirogyra*]). Allied to *E. laxa* Watson, which it resembles in its rounded whorls and pear-shaped mouth, characters in which it differs from others of the genus. Some specimens have more swollen whorls than others; possibly this is a sexual feature.

E. coacto Watson 1886. "The Compact Eulimella." Strongish, acicular, conical, compact; glossy ivory white; growth lines faint, spiral scratches microscopic; spire very long, conical; protoconch turbinate, sinistral, of two-and-a-half whorls, which are turned right over on their side; adult whorls eight or nine, short,

narrow, compact, of very slow increase, slightly convex below and flat-sided above round the top, which forms a slight subsutural border; suture slightly contracted, submarginate below, rather oblique; mouth small, roundly oval, pointed above, oblique; outer lip bent in above, round and patulous below; inner lip sharp, prominent, concave below with a minute furrow behind it. Height 3.5, diam. .7 mm. Cape Jaffa, 90 fathoms. (Type locality—Wednesday Island, N.E. Australia, 8 fathoms, in coral mud). A singularly long and narrow form.

E. tricincta Tate 1898. "The Three-girdled Eulimella." Elongately conical; pellucid white; engraved spiral lines three, one median and one near to each suture, the uppermost cuts off a round cord; protoconch sinistral; adult whorls six, somewhat convex, the anterior whorl margining the suture, last whorl regularly convex and moderately attenuated at the base; one spiral on the base of the body whorl; mouth pyriform; outer lip straight, thin; columella arched. Height 5.5, diam. 1.75 mm. Denial Bay S.A., also King George Sound, Ellensbrook, Yallingup W.A. (Type locality—Streaky and Fowler's Bays, in shell sand). Has somewhat the aspect of *Syrnola jucunda*, but apart from the different generic characters, the shell is narrower and the last whorl proportionately much longer.

E. plunketti sp. nov. Pl. 1, fig. 24. "Plunkett's Eulimella." Very elongate, narrow, tapering very gradually, straight sided; polished, opaque white, with a narrow brown line beneath the middle on each whorl; smooth; protoconch sinistral, of two, smooth, rounded whorls; adult whorls twelve, early ones flat, becoming somewhat convex as they approach the body whorl; mouth very small, ovate; outer lip thin, rounded, somewhat effuse posteriorly. Type—Height 5.6, diam. 1 mm. Cape Jaffa S.A. 90 fathoms. (Reg. No. D10638 S. Aus. Mus.). Similar shape to *E. coarcta* Watson, but whorls are flatter and less numerous, mouth narrower, and has a distinguishing colour band. Named after Mr. J. Plunkett, an energetic member of the Malacological Society of South Australia.

E. turrata Petterd 1884 (*Aclis*). "The Turreted Eulimella." Tapering, turreted, thin; white; whorls seven, last elongated; suture much impressed; mouth small, pyriform. Height 3, diam. 1 mm. Cape Borda, 62 fathoms. (Type locality—North coast of Tasmania and isles in Bass's Straits).

Pseudorissoides Tate & May 1900. Spire and mouth like *Rissoina* (the shell is, however, smooth). Protoconch sinistral, loop-like, as in *Eulimella*. Such a combination of characters seem to be unprovided for in the families *Strombiformidae* or *Rissoidae*. Briefly, the genus is a Strombiformid with a *Rissoina*

mouth, or a Rissoinid with a Strombiformid protoconch. The higher value of the nuclear character in classification requires it to be placed in *Strombiformidae*. Type—*Stilifer tasmanicus* Tenison-Woods 1876 (*Stylifer*).

P. tasmanica Tenison-Woods 1876 (*Stylifer*). "The Tasmanian Pseudorissoina." Small, pyramidal, pellucid, shining; milky white; smooth; protoconch mamillated, sinistral; adult whorls six, convex; suture impressed, scarcely sloping; mouth obliquely pyriform; outer lip produced, incurved, emarginate at each side; inner lip inconspicuous but reflexed. Height 4, diam. 1.5 mm. Rare. (Type locality—Blackman's Bay, Tasmania).

STILIFERIDAE.

"Sea-urchin Snails." Description of shell is that of the only known genus *Stilifer*. Distribution—Europe, West Indies, Australasia, Polynesia, Philippines. Fossil—Records doubtful.

Animal covered with cilia; mantle spread over the base of the shell; head snout-like with side lobes, terminating in a suctorial mouth which is unarmed; tentacles slender, tapering; eyes sessile, placed on the neck behind the tentacles; foot tongue-shaped, partly tubular, with a slit in the sole, produced anteriorly, rudimentary behind. Sexes separate.

Urchin-snails are found among the spines of Sea-urchins; also burrowing or imbedded in the skins of Star-fishes, and producing tumors, often of considerable size. They have been detected enclosed in the basal portions of the spines of a *Cidaris* (Sea-urchin), which had been enlarged for its accommodation. The suctorial mouth strengthens the supposition that food consists of extremely soft or semi-fluid matter, and not of any organisms which have any degree of solidity. Many believe that Urchin-snails subsist on the excretions of Echinoderms; this opinion is founded on the fact that specimens invariably occupy only the area of the anal orifice. Some which have been watched with close and almost unremitting attention for many hours, although they were most lively, nestling or slowly crawling about among the spines of an *Echinus*, never attempted to touch with the mouth either the protruded suckers or the *pedicellariae* of the *Echinus*, or any part of its investing membrane. Urchin-snails do not appear to put their host to the slightest inconvenience. None has been noticed in any other habitat. They are not parasites, and their scavenger habits are said to be not unlike those of dung-beetles. The spawn is deposited on the upper surface of the *Echinus* on which they settle. As many as forty clusters of spawn, with at least a hundred fry in a cluster, have been observed on the upper part of a single sea-egg; this is a

prospective yield of 4,000 specimens, but an *Echinus* could barely accommodate half a dozen mature shells, so we wonder what becomes of the rest. The spawn-masses are oval, each enveloped in a gelatinous case. The fry occupy nautiloid shells of a single whorl, into which (unlike the adult) they are capable of entirely withdrawing.

S. stillifer Broderip 1832. "Urchin Snails." Name refers to the style-like protoconch. Globular or tapering, thin, glassy, pellucid, polished, smooth; protoconch very sharp, sinistral, oblique; adult whorls, numerous, dextral; mouth suboval angulated above, rounded below; outer lip slightly sinuous, thin, simple; inner lip smooth, arcuated, no operculum. Type—*S. turtoni* Broderip 1832, on sea-urchins in British seas.

S. brazieri Angas 1877 (*Stylifer*). Pl. 1, fig. 23. "Brazier's Urchin Snail." Subglobose, polished; pellucid white; smooth, spire elevated; protoconch styliform; adult whorls five, rounded, flattened just below the sutures, which are very finely callously marginate; mouth subovate, pointed above, rounded below; outer lip thin; simple; columella arcuate, very slightly thickened above, the margins joined by a thin, distinct callus. Height 4, diam. 2 mm. Gulf St. Vincent. Rare. (Type locality—Port Jackson. Found on a species of starfish).

S. brunneus Tate 1887. "The Dark-brown Urchin Snail." Subglobose; dark-brown, shining, black-brown around the suture; axial lines, crowded, faint, oblique; spiral lines distant; spire short, acuminate produced; protoconch cylindrical, styliform; adult whorls about four, convex, of moderate increase, slightly depressed at the suture above; last whorl large, faintly angulated at the base and depressed at the suture, and in consequence having a perceptibly subquadrate outline; suture linear; outer lip thin, regularly curved, acutely angled posteriorly; columella thin, slightly elevated, defined by a superficial groove behind. Height 5, diam. 3.5 mm. Port Willunga. Apparently very rare in South Australia; our specimens are smaller and more delicate than typical ones; probably juveniles. Type locality—Parasitic on *Strongylocentrotus* [Sea urchin], invariably on the periproct, in eight to ten fathoms, Capel Sound, Port Phillip). Animal with a large expanded disc-like mantle.

S. lodderae Petterd 1884 (*Stylifer*) (= *S. crotaphis* Watson 1886). "Lodder's Urchin Snail." Elongately pyramidal, thin, shining; milky-white; spiral lines, faint; whorls twelve, moderately rounded, marginate at suture, last whorl subobtuse at periphery; mouth pyriform; outer lip thin, acute. Height 16, diam. 6 mm. Gulf St. Vincent, Spencer Gulf; rare. (Type locality—

North-west coast of Tasmania). Varies a little in form, some specimens almost running into *S. petterdi*. It is never very highly polished, but invariably has a milky-white appearance.

S. petterdi Tate & May 1900 (*Stylifer*) (= *S. robusta* Petterd 1884, not of Pease 1860). "Petterd's Urchin Snail." Tumidly pyramidal, shining; opaque white; spirally lined; whorls nine-and-a-half, rounded, last large, angled at middle; suture much impressed; mouth pyriform; outer lip thin, acute. Height 13, diam. 6 mm. South eastern coasts of South Australia. (Type locality—Leven Heads, Tasmania). Never very highly polished. Perfect specimens appear to be uncommon.



THE SEASON'S GREETINGS.

The Chairman extends to all members sincere wishes for a Happy Christmas-time and a Bright Prosperous New Year.



- 1.—The fare to Humbug Scrub (Bellchambers') on January 30th, will be 5/. Seats must be booked at least three days beforehand either with the Treasurer, Mr. Cotton, at the Museum, or with the Secretary, Mr. E. V. Dix, at the Harbors Board Office, Victoria Square. NOTE.—Cars 9 a.m., not 2 p.m.
- 2.—The *Conversazione* will be held on February 21st at the Women's Club, Hindley Street, opposite the Theatre Royal (entrance in Peel Street). Admission 6d.
- 3.—Mr. Beck does not now deal with our business. Pay direct to Mr. B. C. Cotton, Museum.

ADDITIONS TO OUR LIBRARY.

1. "The Victorian Naturalist." August Number. One of the most remarkable papers is that on two new subterranean Australian orchids. The first was found in W.A., the second, quite distinct, in N.S.W. The new one was found among the roots of *Dipodium punctatum* (the Hyacinth Orchid), which blooms in summer in our hills. There is a good article, with a fine coloured illustration of the Lesser Phalanger (*Petaurus breviceps*) or Sugar Opossum.
2. "The Victorian Naturalist." September Number. This contains an interesting article on Australian Sea-Slugs, with several other informative papers.
3. "The Victorian Naturalist." October Number. The chief article is one on Australian Hepaticas or Liverworts.
4. Papers of the National Polish Museum.

THE FLORA BETWEEN OUTER HARBOUR AND SELLICK'S BEACH, SOUTH AUSTRALIA.

By J. B. CLEELAND, M.D.

The area incuded in this survey is limited to the north by the Outer Harbour at the tip of Lefevres Peninsula, to the south by the cliffs and rocks that commence at the end of Sellick's Beach, to the west necessarily by the sea, and to the east by the Port River as far as Port Adelaide and then by Tapley's Hill Road, succeeded by the South Road, to Aldinga and on to Sellick's Hill. From a botanical point of view, the area can be divided up into the following divisions: (1) Marine Meadows; (2) Modern Sand Dunes or Sandhills stretching from the Outer Harbour to Marino, appearing again over small stretches further south; (3) The Saltwater Swamps in the neighbourhood of the Port River and Patawalonga Creek; (4) The Reedbeds at Fulham now mostly drained; (5) The Pinery (on old sand-dunes) on the east side of the Port River between Alberton and the Grange; (6) The Scrub at Hallett's Cove; (7) The very similar Scrub at Sellick's Beach; (8) The Cliffs between Marino and Sellick's Beach; (9) The cleared and often cultivated land on the plains and on the undulating country between the South Road and the sea; and (10) the Banks of the several Freshwater Creeks that empty themselves into the sea.

(1). Marine Meadows.

The coast-line from Outer Harbour to Marino consists of very gradually shelving sands finally succeeded by the blue line where the water deepens and the yellow of the sand is replaced by a dark blue due to the under-water meadows of *Cymodocea* and *Posidonia*. In October both here and at Christie's Beach the latter has been washed up in bud after storms; the banks of sea-weed, often so abundant and delightfully comfortable to sit on, are formed of the washed-up leaves of this plant; the fibrous remains of the leaf-sheaths have been suggested for use in making wool-packs.

(2). The Sand Dunes or Sand Hills.

From Outer Harbour to the rocks south of Brighton extend a series of sand-dunes or sand-hills, broken only over these 17 miles by the seaside towns that have arisen on them and by the exit of the Patawalonga Creek. From the latter to Outer Harbour, the sand-dunes are bounded on the east side by the tidal

waterways connecting the Patawalonga with the Port River, by the latter and by the saltmarshes resulting from tidal overflow. The tallest of the sandhills are near Estcourt House between the Semaphore and the Grange, the height probably reaching to about 50 feet. The breadth of the sandhills is only a few hundred yards. On the sea-front is a sharp rise immediately eastward of the highest tidal limits. This is followed by a shallow depression (swale) and then usually by the highest part of the dunes, with a fairly sharp descent on the landward sides, or there may be three rises altogether and two swales. In places the sandhills are bare and of shifting dazzling white sand, but for the most part, except on the actual seafront, they are covered with a vegetation of their own.

This vegetation is more or less sand-binding. On the seaward aspect we have the extensively spreading, creeping and rooting branches of the grass *Spinifex hirsutus* whose large female heads of flowers become detached and are readily blown along by the wind. Tussocks of the Sword Rush (*Lepidosperma gladiatum*) are numerous throughout the dunes; tufts of the tall *Scirpus nodosus*, often single or a few together, appear in diffuse colonies; and *Cladium junceum* also occurs in places. Several species of shrubs, more or less prostrate or else bent to one side by the strong sea breezes, are conspicuous denizens of the sandhills, but like the rest of the plants, are more or less widely scattered. The composite *Olearia axillaris*, with its glaucous hairy narrow leaves and small heads of rayless flowers, forms upright or spreading bushes whose gnarled trunks some inches in diameter, indicate that many are of considerable age. *Myoporum insulare* usually shows the effects of the prevalent winds by being blown over to one side; its branches are distorted and gnarled and often some are dead or dying. *Scaevola crassifolia* with thick serrated leaves and racemes of bright blue flowers spreads itself out over an area sometimes of eighteen feet in diameter, the shrubs being about two feet high. The tea-tree *Melaleuca pubescens* is occasionally seen, spreading out from the effects of the wind so that it is here a low shrub instead of a miniature tree. Small shrubs of *Acacia longifolia* var. *Sophorae* occur between Henley Beach and Glenelg. *Leucopogon parviflorus* is a smallish shrub, not very common, with lanceolate striate leaves, small white flowers and white edible fruits. Unfortunately the introduced African Box-thorn (*Lycium ferocissimum*) is getting an extensive hold, the seeds being distributed by birds.

The Euphorbiaceous shrub *Adriana Klotzschii* is common, *Alyxia buxifolia* (Apocynaceae) with small white flowers less so. The Evening Primrose *Oenothera odorata* grows well, the longer-flowered *Oe. longiflora* being rarer. *Clematis microphylla* scrambles through various shrubs as does *Muehlenbeckia adpressa* to some extent.

Near Glenelg, in the depression between the two ridges, the Holly-leaved Grevillea (*Grevillea ilicifolia*) may be found. *Acacia ligulata* is a small shrub with scattered phyllodes instead of leaves. The Muntrie (*Kunzea pomifera*) may be found as small prostrate colonies composed of creeping and rooting partly buried branches which can be readily torn up from their sandy beds; the small fruit is edible and has a taste like apples. The glaucous *Atriplex cinereum* forms a handsome upright shrub on the actual strand or the sand ridge over-looking this; the female flowers have a purplish tint at times and make quite a pretty appearance. Colonies of the low growing *Atriplex paludosum* sometimes appear in the sand near the sea, and here also grows *Nitraria*. Between these sedges and shrubs, a number of herb-like or low spreading plants are to be found whilst spring-time sees many annuals such as grasses. *Pimelea serpyllifolia* is a common small shrub a foot or more high with small yellow flowers. Sea-rocket (*Cakile maritima*), a crucifer with bluish-purple flowers, and *Senecio lautus* with yellow rayed flowers and when growing on the sand with rather fleshy leaves, are common. Greyish-white masses of *Calocephalus Brownii* grow on the seaward slopes in places. *Salsola kali*, the Rolly-Poly of the interior, is here a very rigid and prickly undershrub never detaching itself to be blown about. The Australian Blue-bell (*Wahlenbergia gracilis*) grows in sand with many upright stems, almost bushy, with small blue flowers. *Rhagodia baccata* and *Threlkeldia diffusa* are common Chenopodiaceous undershrubs, *Enchytraea tomentosa* less so. *Tetragonia implexicoma* has a spreading habit. *Pelargonium australe* is abundant. Tufts of the grass *Poa caespitosa* are numerous. Other grasses, with the exception of occasional patches of couch (*Cynodon dactylon*) or of the harsh *Distichlis maritima*, are mostly annuals and comprise a stout broad-leaved *Stipa*, *Danthonia*, *Ehrharta longifolia*, *Lolium subulatum*, *Bromus villosus*, *B. madritensis*, *Agropyrum scabrum*, etc. *Lomandra leucocephala*, with its stiff leaves and masses of flowers grouped in patches along the flowering stem, is not infrequent but *Lomandra glauca* is rather rare, being found, for instance, a mile north of the Grange. Another Liliaceous plant,

Dianella revoluta, with blue petals and blue berries and long stiff leaves, grows in tufts. Pig-face (*Mesembrianthemum aequilaterale*) trails extensively over the ground. The Ice-plant (*M. crystallina*) has established itself in places. The introduced composite *Reichardia picroides* occurs at the Grange. *Sonchus megalocarpus* is found in places. South of Henley Beach are a few plants of Prickly Pear (*Opuntia*). The Scarlet Runner (*Kennedia prostrata*) spreads over the ground and the sweet-scented white-flowered pea *Lotus australis* is a small undershrub. In spring-time the introduced yellowish annual *Euphorbia falcata* is very abundant, forming extensive patches, and other small annuals such as *Melilotus*, *Crassula Sieberiana*, *Geranium pilosum*, *Brachycome ciliaris* and *Daucus glochidiatus* may be found. The Crucifer *Stenopetalum lineare* has been found as a very slender form near Outer Harbour. About two miles south of Henley Beach in October and November, colonies of the parasitic leafless *Orobanche australiana* may be found. An introduced *Orobanche*, *O. Mutelii*, has been found near Glenelg. The everlasting *Helichrysum leucopsidium* also occurs here.

At Port Noarlunga, *Scaevola crassifolia*, *Myoporum parvifolium* and *Nitraria* are all acting as sand-binders.

The chief plants in the sandhills at Moana, south of Port Noarlunga, are *Spinifex hirsutus*, *Scirpus nodosus*, *Threlkeldia diffusa*, *Salsola kali*, *Atriplex cinereum*, *Tetragonia*, *Cakile maritima*, *Myoporum insulare* and *Olearia axillaris*.

IN MEMORIAM.

We regret the loss of an enthusiastic member and indefatigable worker in the passing of Miss Minna T. P. Roeger, who for a number of years those of Magazine Manager, Treasurer, and Librarian. Miss Roeger was greatly interested in the study of Nature, and experimented in the cultivation of the native flora and was an enthusiastic worker in the Malacological Society. Her enthusiasm and energy made her a valuable member of the Section and her personal qualities endeared her to a very large circle of friends.

EXCURSIONS, 1932.

March 5, 1932.

Mt. LOFTY.—The Chairman, Mr. E. H. Ising, invited the members to afternoon tea at his residence in Stirling. The party inspected the Native Plants grown by the Chairman, and a very pleasant afternoon was spent.

May 7, 1932.

PROSPECT.—A visit was paid to Mr. A. J. Wiley's factory, where mulga (*Acacia aneura*) from Central Australia was turned into useful articles such as vases, ornaments, inkstands, hall stands, serviette rings, jewel boxes, etc.

May 25, 1932.

TWEEDVALE.—The Council of the Institute of Public Administration invited a limited number of members to accompany them on a visit to the Tweedvale Woollen Mills and the Cricket Bat Factory. The various processes in the making of woollen goods were explained by members of the Mills.

June 6, 1932.

HALLETT'S COVE.—A large party of members took train to the Cove and were met there by the leader, Mr. C. T. Madigan. The well-known glacial features of this important geological locality were lucidly explained by the leader and the various effects of glacial action were pointed out.

June 25, 1932.

LONG GULLY.—An afternoon was spent among the fungi on the north side of the station. Many species of various colours and sizes were collected, and each was explained by the leader Professor J. B. Cleland.

July 9, 1932.

BROWNHILL CREEK.—The Chairman, Mr. E. H. Ising, led a party to study the native gums. The red gum (*Eucalyptus rostrata*) and blue gum (*E. leucoxylon*) were pointed out and described. Much of the valley through which the creek flows is reserved and small plantations of gums were noted, among them being the Yate gum (*E. cornuta*).

August 16, 1932.

MARINO.—Only seven members, under the leadership of Mr. J. A. Hogan, made the trip. As the afternoon proved to be a very wet one, the party did not go further than the kiosk.

**FIELD NATURALISTS' SECTION OF THE
ROYAL SOCIETY**

Publications of the Section.

No. 1.—“The National Parks of Australia,” by Wm. H. Selway. (Out of print).

PUBLICATION NO. 2

GEOLOGICAL AND BOTANICAL NOTES

on the

VICTOR HARBOUR DISTRICT

by

PROF. J. B. CLELAND, M.D., and

PROF. WALTER HOWCHIN, F.G.S.

Published by Cole's Book Arcade,

Price 1/-.

1. A. E. 1933

The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal Society of South Australia and of the South Australian Aquarium Society.

Adelaide



Feb. 1933

Vol. XIV.

No. 2

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Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. B. Cotton, the Museum, North Terrace, or with the Secretary, Mr. E. V. Dix, Harbor's Board Office, Victoria Square. In the case of Motor Trips, ticket is to be paid for at time of booking.

EXCURSIONS and LECTURES.

February 18—Blackwood Experimental Orchard Train at 1.15 p.m. Fruit Culture. Mr. R. Fowler.

March 4—Outer Harbour. 1.18 Train to Glanville or 2.00 Train to Outer Harbour. Dredging.

March 11—Aldgate Flower Show. Train at 1.15 p.m. Dr W. Christie.

March 18—Mt. Lofty Flower Show. Train at 1.15 p.m. Mr. A. J. Morison.

April 1—Outer Harbour. Train at 1.35 p.m. Shells. Mr. W. J. Kimber.

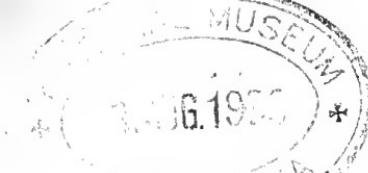
April 25—Mr. R. T. Melrose's, at Mount Pleasant. Motor (T. & G.) at 9 a.m. Trees. Mr. W. C. Hackett.



February 21—Conversazione.

March 21—An Introduction to Microscopy, by Mr. W. H. Harding.

April 18—The Main Soil Classifications of S.A., by Professor J. A. Prescott, M.Sc., A.I.C.



The South Australian Naturalist.

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ADELAIDE, FEBRUARY, 1933.

No. 2

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF S.A.

ANNUAL MEETING, 9th AUGUST, 1932.

Address by the Chairman, Mr. E. H. Ising.

I do not propose to make a review of the year's work in our Section, as the Hon. Secretary does that in the Annual Report, but I wish to stress the objects for which the Section was founded and point to some of the branches of natural history which can be studied.

Among the items of information on the back of our programme card you will find that "this Section was founded in 1883 for the purpose of affording observers and lovers of natural history regular and frequent opportunities for discussing those special subjects in which they are naturally interested; for the exhibition of specimens and for promoting observation in the field by means of excursions to various collecting grounds around the metropolis."

The Section has always provided, at some expense, these opportunities for discussing natural history subjects and for visiting the collecting grounds but the opportunities have not always been accepted and to-day we have not the number of individual workers in natural history that we might have.

When Dr. Fenner gave his annual address, he pointed out that only a small proportion of members were actively engaged in some natural history work. The proportion is still only small and I wish, and I am sure many of our members do as well, that more would take up some definite line of study. With the idea of helping members to choose some subject I am now giving a list of some of the branches which are waiting for workers.

The field is illimitable but members do not need to be appalled by the scope for study in nature but to select a subject or branch for which they feel adapted.

In a broad sense there are three main divisions:—

1. The Vegetable Kingdom
2. The Animal Kingdom.
3. The Mineral Kingdom.

The interested nature-lover wants to choose first of all which of these three appeals most. When that is decided, then a more detailed examination can be made of the particular "kingdom" chosen.

I. THE VEGETABLE KINGDOM is concerned with plant life and covers the forms from the minute alga living a commensal life with a fungus, the combination being what we call a lichen, to the tallest trees of the forest. There are many ways in which plant life may be studied and they include the following:—

- A FORM, or external structure (morphology).—This is the recognition of the various forms assumed by the growing plant. The shape, size, and number of the various organs in comparison with others of the same class is included in this branch. This study gives system to the vegetable kingdom and simplifies the work of the botanist in identifying the various plants.
- B INTERNAL STRUCTURE deals with cells which make up the plant tissues. The study of this part of botany is perhaps more vast and certainly more intricate than that of the outward form and requires the aid of the microscope. There are the cell forms for the various work to be performed; the cell contents—some for sap conveying, some for storing food, some for strengthening the plant, some for reproducing themselves and others for manufacturing food by the aid of sunlight. There are many other wonderful things to learn of cell structure all of which are very fascinating.
- C PHYSIOLOGY is the science of the normal functions and phenomena of living things—and this applies to plants. In connection with vegetation there are the functions of breathing, which create many adaptions on account of the various habitats or situations in which they grow; the absorption of water which is so necessary to plant growth, the means used by the plants to regulate the supply according to the physical conditions surrounding them; how and why these functions are carried out comes under this heading and books (not merely papers) are necessary to explain all this.

D What comprises a most interesting line of investigation is called ECOLOGY or plants at home, i.e., the plants and their surroundings and life companions. By noting the kinds of plants in a particular piece of scrub, forest or flat and their relative dominance or otherwise, this gives the character of the vegetation—such as a Eucalyptus forest (where the Eucalypts are the main tree, heath country (where the heath predominates) or rush swamp (where the rushes form the main species.) Then the divisions into which this particular study can be made are innumerable and all are full of interest to the searcher after nature's secrets. The endeavour to solve the "Why?" in nature will lead the investigator into many intricate paths, some of which may reveal their goal, others may hide their final aim to all but the most skilful and patient student. However, not to find the answer to every "Why?" does not mean a lack of revealed wonders by the way and those of us with the least knowledge of these things will find a wealth of interest in any of the innumerable side tracks, which may lead to main avenues, if studied persistently.

But to come to something practical, I will mention a few of the items of botany of special groups which will repay a close examination.

- a. Wattles (Acacia spp.)
- b. Ferns.
- c. Water Plants.
- d. Mosses.
- e. Seaweeds.
- f. Grasses and Fodders.

It is pleasing to know that some of our new members are taking up the study of special groups and they are setting an example which could be emulated by many more of our members.

H. THE ANIMAL KINGDOM.

- A. The Mammals.
- B. Fish.
- C. Marsupials and Reptiles.
- D. Birds.
- E. Insects.
- F. Shells.

These are a few random headings and they include a vast number of forms even under the separate heads. I cannot deal with each of these items, so I will mention two in more detail.

BIRDS form a fascinating study in themselves and while I think scientific collecting is necessary for the advancement of science and enables us to use these gifts to better advantage (I would always condemn the killing of rare species), collecting or destroying bird life is to be deprecated. The avifauna may be studied from the following angles:—

1. Distribution.
2. Habitats or homes and surroundings.
3. Agency in fertilization of flowers.
4. Song and mimicry.
5. Nidification or nest building.
6. Oology or egg study.
7. Colouration.
8. Food.

INSECTS.—When I think of the enormous family of insects, considered by one worker in 1883 to comprise about 150,000 species, it seems almost a hopeless task to try and know all about them or where to start in the study of them. But we can be like one of our late members, Mr. Lea, who in his life time named about 5,000 species, but specialised in beetles only.

The class INSECTA is conveniently divided into three main tribes according to the number of the feet.—

- I. HEXAPODA—6-footed.
- II. ARACHNIDA—8-footed.
- III. MYRIPODA—many-footed.

In dividing up the first tribe we have 8 separate families

1. HYMENOPTERA—Membrane-winged.
a Bees, with their wonderful social life, their architectural powers and honey producing properties.
b Wasps, with their interesting life history in finding their prey and laying the egg in the stupefied grub.
c Ants, whose study reveals a communist spirit on right lines.
d Sawflies also belong to this group.
2. LEPIDOPTERA. Scale winged, so named on account of the wings being covered with minute scales.
a Butterflies of wonderful colouring and enormous size in the warmer parts of the continent. The metamorphosis or changing from the grub to the larva and pupa is one of the wonders of creation.
b Moths, whose feathery antennae are akin to wireless aerials.

3. DIPTERA—Two-winged.

a Flies of all sorts come under this heading and they all have only one pair of wings. Although they form food for certain birds, they are in general a pest both to mankind and animals. The study of them is an economic necessity as they are germ and disease carriers.

4. COLEOPTERA—Sheath-winged, one pair covering the other more delicate organs.

a Beetles form a very large class. Some are useful, such as the lady bird which destroys the scale insect attacking orange trees. Others are pests which bore into wood and furniture and cause much damage.

5. HEMIPTERA—Half-winged.

a Bugs, plant and body lice, etc. form this group. Some are injurious to crops and fruit and the entomologist has to know his bugs to be able to combat their ravages.

6. ORTHOPTERA—Straight-winged.

a Grasshoppers, locusts, crickets, walking-stick insects, katydids, mantids and cockroaches all come within this group. We know them mostly as harmful pests but I suppose they play some part in the economy of nature. Many birds feed on grasshoppers.

7. NEUROPTERA—Nerve-winged. These creatures have 4 naked membranous transparent wings with net-like veins or nerves.

a White ants, may flies, dragon flies (wrongly called horse-stingers, but they have no sting therefore they cannot sting horses) and scorpion flies belong to this family.

8. THYSANURA—Shield-tailed.

a Bristle tails and spring tails belong here, and they are a class about which the average person knows nothing. I read a recent article in "The Victorian Naturalist" with regard to the spring tails.

III. THE MINERAL KINGDOM.

I am not qualified to speak on this subject, but as a field naturalist one picks up a little knowledge here and there. Some lines of study in this large and important economic branch of field work are these:—

1. MINERALOGY.—The study of the rocks as specimens of the earth's crust. Whether it be of igneous or volcanic origin or whether formed by deposition and hence called sedimentary. Their structure and grain would come under this study.

2. GEOLOGY.—Under this general head one would study the formation of the rocks in the field and their relations with other series of rocks.

3. PHYSIOGRAPHY.—The contours resulting in the general weathering and bending of the various strata into plains and ranges would come under this heading.

The above will suffice to show members that there is a wide field to choose from and the best policy is for the nature-lovers to take an interest in the subject which appeals most.

One cannot get far without having recourse to books and of these there is no end. Our Public Library is full of works dealing with the various sciences and the attendants are at the service of the public so that by asking to be shown books on any given subject you are at once brought into touch with standard and up-to-date volumes which will satisfy the most ardent student.

Our own Library which is stored in cupboards in the inner room here, has many works of interest and these books are at the disposal of all the members. I can recommend the "Victorian Naturalist" as a journal that contains a large number of articles on subjects which we all study and on others which are little known. Just to take an example, taking a volume which covers three year's publications, there were the following subjects dealt with—

Botany, Aboriginal Implements, Serpulids (the segmented worms), Butterflies, Fungi, Eucalypts, Shells, Aquatic Protozoa, (one-celled animals), Aquatic biology, Aquatic house-builders, Fossils, Ants and Termites, Sea Urchins, Crickets, Ferns, Spiders, Microscopy, Orchids, Insects generally, Birds, Beetles, Ethnology, Salt, Thrips.

And all of these written from the Australian standpoint. Then we have works dealing with special subjects so that you have plenty of material to assist you in the study of almost any subject you care to take up. In conclusion, I would urge the members to take up one special line of investigation, and I am sure that those who know something of the particular subject in question will only be too glad to give all the information possible to assist. Personally I am always ready to help in Botany and I should like to see some members take up the study of Ferns or Wattles or Grasses, or other such subjects.

THE FLORA BETWEEN OUTER HARBOUR AND SELLICK'S BEACH, SOUTH AUSTRALIA.

PART II.

—The Saltwater Swamps in the neighbourhood of the Port River and Patawolonga Creek.

By J. B. CLELAND, M.D.

On the banks of the River within tidal influences, the Mangrove (*Avicenna officinalis*) with its finger-like pneumatophores projecting out of the mud when the tide is low, is the most striking object and is obviously of service in reducing the danger of erosion. The Mangrove extends as far south as Kaimes near Estcourt House.

A dense growth of Paper-bark Tea-trees (*Melaleuca halimaturorum*), about fifteen feet high, at one time clothed the banks of the Port River, as far at least as the Grange, and extended as dense thickets a quarter of a mile through along subsidiary waterways and on the Saltwater Swamps. Such a thicket, for instance, stretched from the Port River to that portion of the Military Road that extends along the landward side of the sandhills between Estcourt House and the Grange. There are still fringes of these trees in places and parts of the thickets still remain in places between Glanville and the Grange. During the last two or three years, with the onset of bad times, the greater portion has, however, been cut down for firewood and the saltwater-swamps left without the protection of these trees. Outside the area we are considering round the North Arm of the Port River and up to St. Kilda, there are still extensive stretches of Mangrove and Tea-tree Swamps.

Underneath the Tea-tree, as for instance near the Grange, is an abundance of *Suaeda maritima*, the individual plants varying often in colour, some having a purplish tint. The several species of Samphire are also abundant. Other lower shrubs which are common are the pink-flowered *Frankenia pauciflora*, the white-flowered *Samolus repens*, the Billy Button (*Cotula coronopifolia*), and not quite so numerous the herb-like *Apium australe* and *Hemichroa pentandra*. Where the Tea-trees are absent, the saltwater-swamps are clothed with the same under-shrubs, the Samphires being the dominant features. The presence of *Cotula coronopifolia* probably indicates a great access of fresh-

water during the winter rains unnulling the effects of the salt water. The grass *Sporobolus virginicus* is abundant in places, and *Distichlis spicata* also occurs. *Spergularia marginata* is common, whilst there are scattered small bushes of *Atriplex paludosum* and *Kochia oppositifolia* and occasional plants of *Suaeda* and of the grass *Glyceria stricta*. The Black Tea-tree (*Melaleuca pubescens*) may occasionally be found growing round the edge of the swamps. The introduced Ice-plant (*Mes. crystallinum*) also occurs on these flats. Other small plants found near the edge are *Triglochin mucronata*, *Scirpus antarcticus*, *Bassia uniflora*, *Sagina apetala*, *Aira minor* and the introduced *Statice*. Some of these which are annuals are perhaps more freshwater plants than salty-swamp plants, taking advantage of the winter rains to grow in this situation.

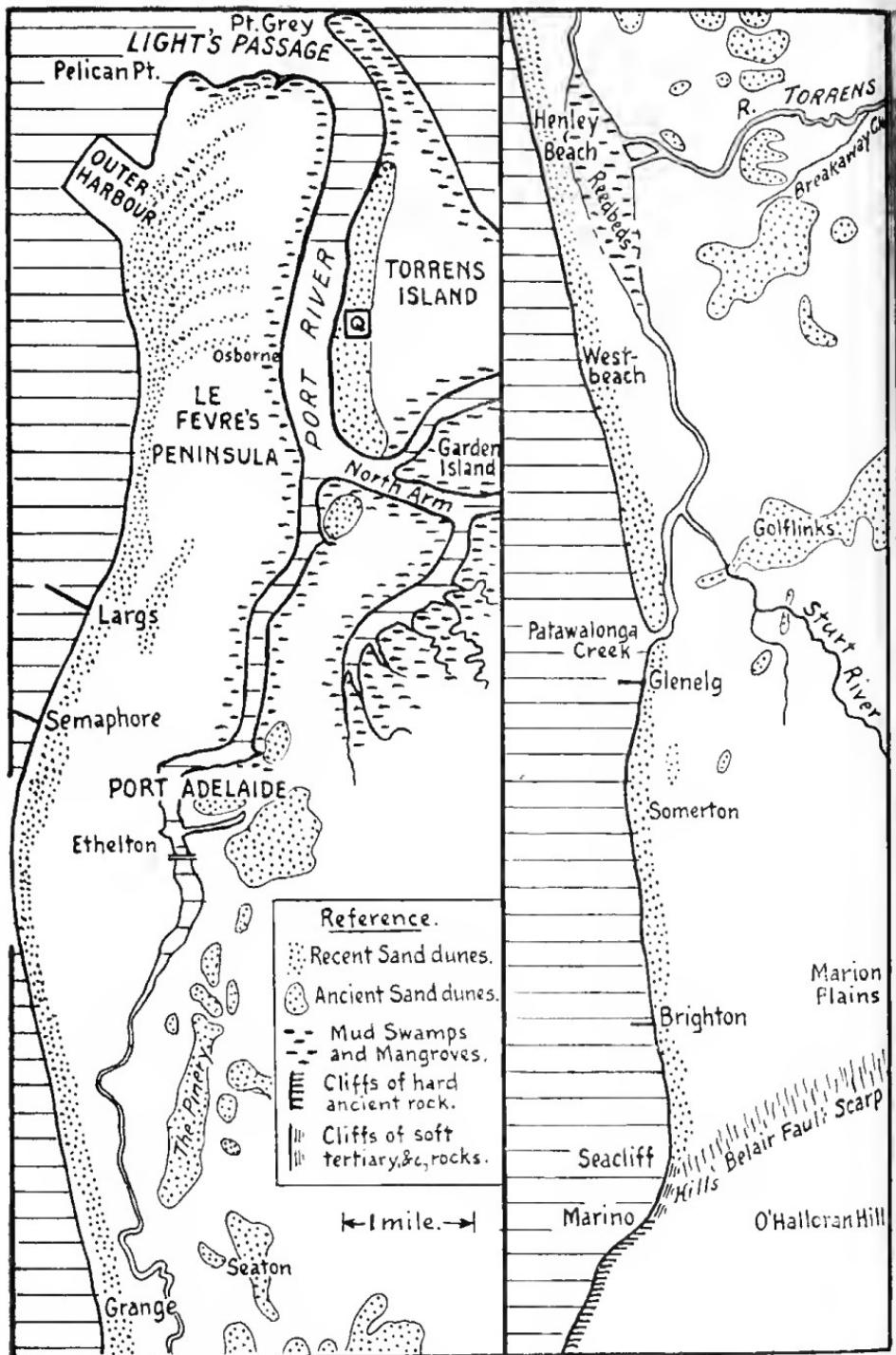
The salt-water flats near Outer Harbour are covered chiefly with the Samphires, and *Suaeda*, *Atriplex paludosum*, *Kochia oppositifolia* and *Frankenia* are scattered amongst these. Also, where opportunity offers are the more lowly *Spergularia marginata* and the Rye-grass *Lolium subulatum* in abundance. The two Mesembrianthemums occur, *M. australe* on the salty flats and *M. aequilaterale* on sandy patches. The introduced *Senecio vulgaris* and the grasses *Sporobolus virginicus* and *Distichlis spicata* skirt the edges. The upright salt-marsh living grass *Glyceria stricta* occasionally grows through one of the undershrubs. A few plants of *Statice* are to be found, the seeds having evidently been distributed by the tides. *Cakile maritima* and a few *Nitraria* bushes grow in the strand on the Port River side of the Harbour. *Melaleuca halimaturorum* still clothes the sides of the channel farther up. In the angle formed by the breakwater and the Largs Bay foreshore, sand and seaweed (*Posidonia* leaves) are accumulating and *Suaeda* in abundance and a few Samphires are colonising the area. On the landward side of this, a number of plants of the little cress *Hutchinsia procumbens* were found growing in October.

The reclaimed land, part a recreation ground, round which the railway line turns, is the home of an abundance of introduced weeds and grasses, as well as a few Stipas, Danthonias and Vitadinias. The pea *Trigonella monspelia* from the Mediterranean has just established itself.

(To be continued).

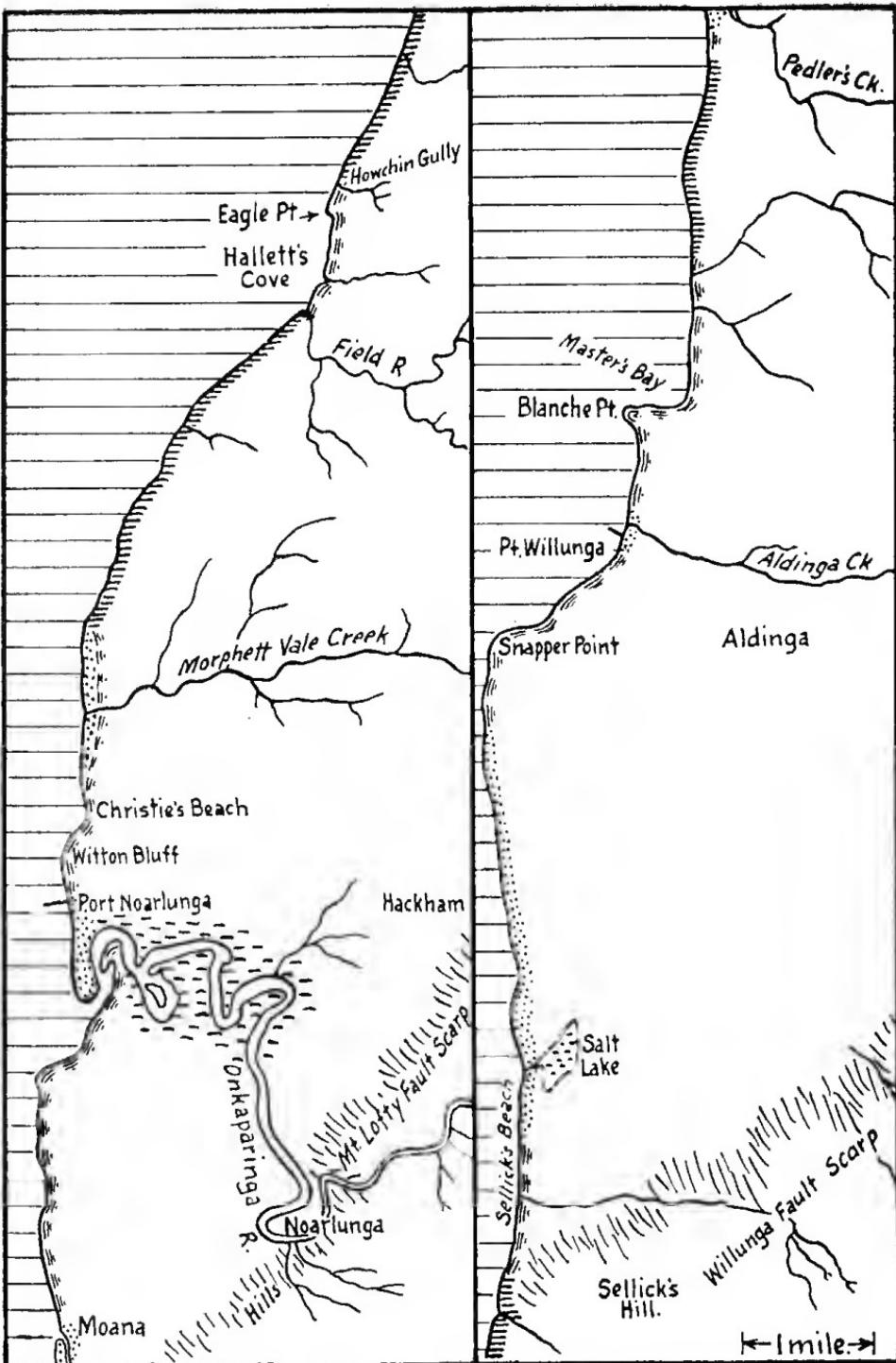
The accompanying map shows the Coastal Districts dealt with in Prof. Cleland's articles. In a succeeding number the physiography of these areas will be set out.





No. 1. PELICAN POINT TO THE GRANGE.

No. 2. HENLEY BEACH TO MARINO.



NO.3. HALLETT'S COVE TO MOANA.

NO.4. MOANA TO SELICK'S HILL.



SHELLS.

By BERNARD C. COTTON.

(Given in the form of a lecture to this Society on the evening of November 15th).

Almost everyone has seen and admired the beautiful shells found on sea beaches. It is about the structure of these and their relatives this article is written. The animals which make the shells are soft-bodied creatures without bones and so they are called *Mollusca* from the Latin *mollis* = soft. They are divided into four different groups.

Firstly, the *Pelecyopoda* (meaning "axe-footed"), a representative of which is the cockle. Secondly, the *Cephalopoda* (meaning "head-footed"), for instance, the cuttle-fish and octopus. Thirdly, the *Gastropoda* (meaning "belly-footed"), with spiral shells like the periwinkle. Fourthly, the *Scaphopoda* (meaning "scoop-footed"), or the tusk shells which have a scoop-like foot at the wider end.

The cockle may be compared with a book standing slightly open on a table hinge uppermost (fig. 1A, B.)

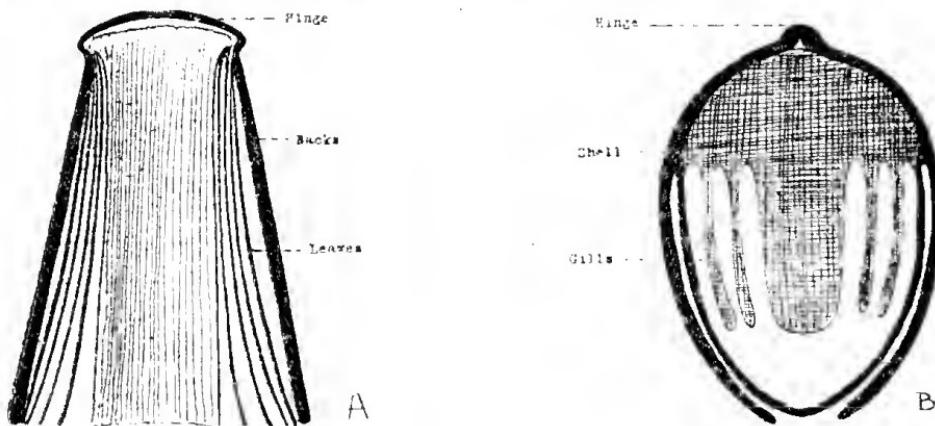


Fig. 1. A.—Section of a book. B.—Section of a Cockle.

The backs represent the shell; the hinge, the hinge of the shell; the leaves the gills. The gills procure oxygen for the animal from the current of sea-water in which they are bathed. They also act as filters to obtain the minute life which is the cockle's food. The gills are so constructed as to present the greatest possible surface to the oxygenating sea-water—just as our lungs form a large surface exposed to the inhaled air. A small section of the gill (fig. 2) looks something like the radiator of a car, and, in fact, has a similar function, only the radiator exposes a maximum surface to the air for cooling the water it contains.

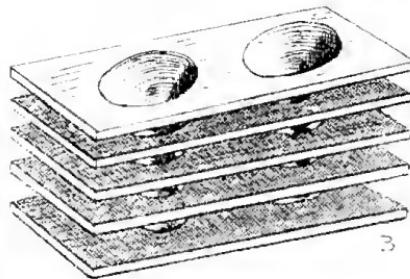
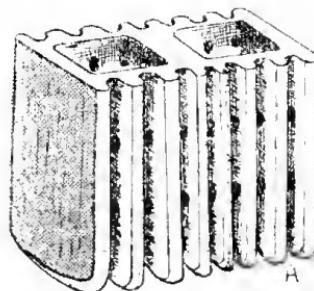


Fig. 2. *A*.—Section of the gill. *B*.—Section of the radiator of a car.

The gills are enclosed in a fleshy bag with an inlet and outlet hole for the water circulation (fig. 4A). Where the shell is of a burrowing kind, the holes are replaced by long tubes which project above the surface of the sand in communication with the clear water above (fig. 3B).

The animal has no head and no real mouth (though primitive forms most likely had), the alimentary tract being little more than a tube with the gullet at one end the rectum at the other, and, peculiarly enough, passes through the heart (fig. 4A). The shell is in two parts and on the inside of either may be seen (fig. 4B), the scars of two muscles which close the shell; an elastic like ligament which opens the shell as the spring opens the

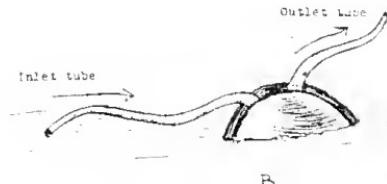


Fig. 3. *A*.—The fleshy bag with inlet and outlet holes. *B*.—The long tubes of the burrowing cockle.

lid of a snuff-box; and beneath this the hinge teeth which interlock the two halves of the shell. It is supposed that most primitive cockles had no hinge teeth, later vertical ones formed, then horizontal, and then a combination of both. Even this specialised combination is not strong enough for the gigantic Queensland clam, which has accordingly developed an undulating margin opposite the hinge teeth so that the heavy shell may

interlock more securely. Connecting the two large muscle scars is a line which follows the margin of the shell, though somewhat removed from it. This is formed by the numerous, small muscle-scars which attach the outer fleshy bag of the animal to the shell. At the rear end the line takes a sudden inward loop, where the inlet and outlet tubes project.

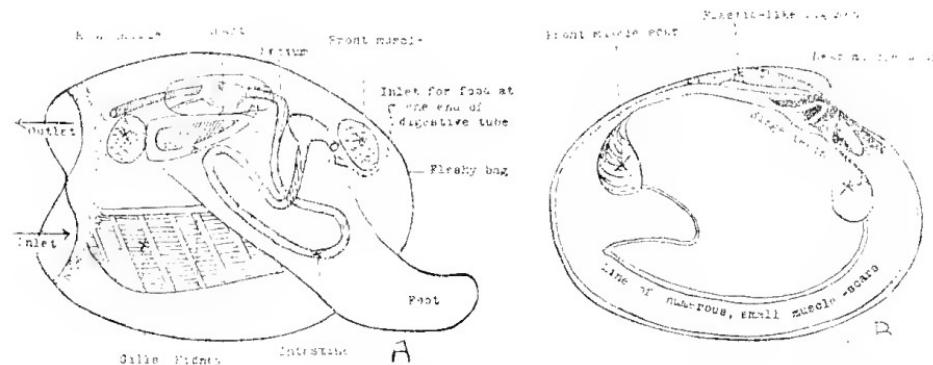


Fig. 4. A.—The alimentary tract of the cockle. B.—An inside view of the shell.

As an example of the *Cephalopoda* we might take the cuttlefish (fig. 5A). A flat, purse-shaped creature with eight arms provided with suckers, radiating from the head, and two tentacular arms capable of expansion and retraction. The eyes are well-developed and within the body is situated an ink bag to produce a protective smoke-screen effect. A wonderfully light, calcareous, honey-combed structure, the cuttlebone (fig. 5B), is situated in the back and serves as a back-bone, though it is really the remains of a shell once capable of containing the whole animal, but now contained by the animal. It may be likened to a

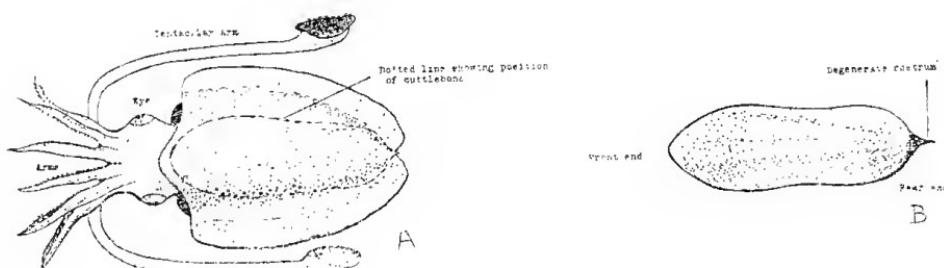


Fig. 5. A.—The Cuttlefish. B.—The Cuttlebone.

chambered Nautilus shell which has gradually been pushed back in the course of its spiral and only the flattened aperture and the earlier chamber partitions closely packed, like a pack of cards, remains (fig. 6A, C.)

Indeed at the rear end of the Cuttlebone may still be seen a degenerate rostrum, so large and heavy in the fossil species, but here reduced to an insignificant useless spine which is lost in the adults of some Cuttlebones, but always present in the

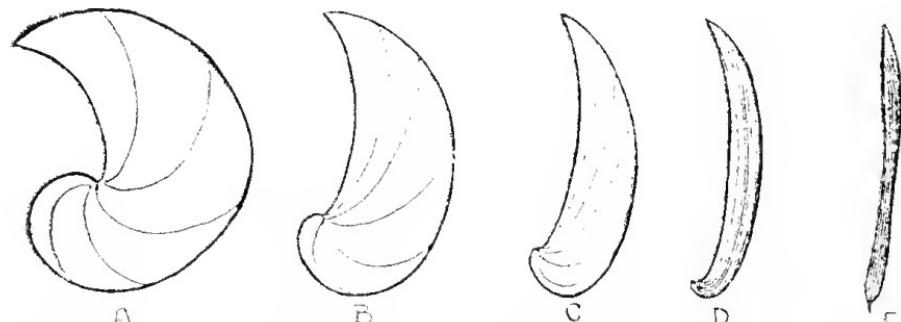


Fig. 6....A.—The section of a Nautilus. C.—The section of a Cuttlebone. B., E., D.—Supposed intermediate stages.

juveniles. The Octopus is another example of the *Cephalopod*, but here the shell is entirely lost, though a small cartilage in the back indicates its former presence. Although without internal shell or skeleton on which to obtain leverage, the octopus is exceedingly strong. The suckers, even in a dying specimen, need all one's strength to detach them from their hold.

The *Cephalopoda* and the next kind of *Mollusca*, the *Gastropoda*, are provided with a ribbon-like tongue beset with teeth, and used for grinding food. As the teeth are worn the ribbon moves forward, bringing new teeth into position. The *Gastropoda* are distinguished by their spiral shell, which is really a gradually widening tube wrapped spirally on itself. This usually turns to the right, but rare, abnormal specimens turn to the left. When this occurs, the various organs in the animal are also transposed as in the rare case of a transposition in a human being, where the heart, appendix, spleen, and other organs are on the right side and the person is consequently truly left-handed. However there is another form of abnormality, the ultra-dextral shell where the spire has been, as it were, pushed through the

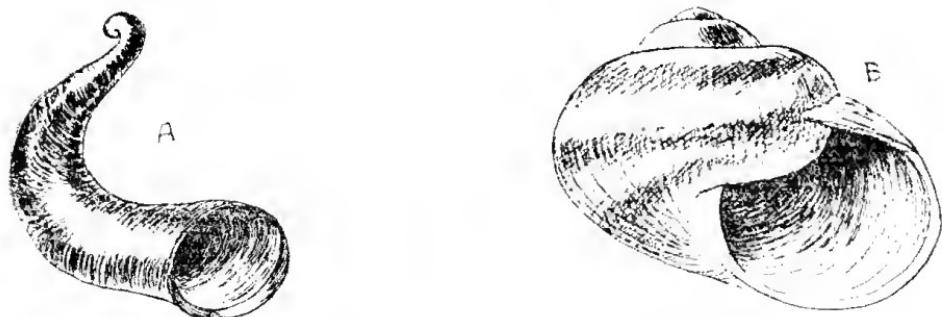


Fig. 7. *A*.—A loosely coiled garden snail. *B*.—A normal snail.

centre of the shell and out at the other side, when the animal remains dextral and the shell is virtually sinistral. Another disease results in loose coiling, and in extreme cases the whole shell, normally making say half-a-dozen turns, makes only one or two (fig. 7). In addition there are many malformations due to fracture and repair during life.

The last kind of *Mollusca*, the *Scaphopoda* are comparatively rare. They resemble an elephant's tusk in shape, consisting of a slightly bent, gradually widening tube, ribbed or smooth, a scoop-like foot projecting at the wider end.

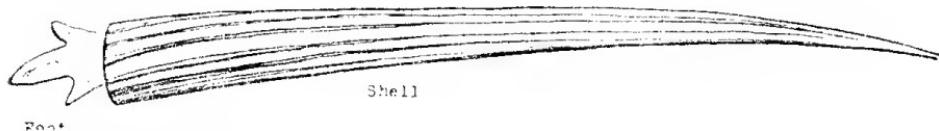


Fig. 8. The Tusk Shell.

The tubular shell, and the possession of a ribbon-like tongue suggests their relation with the *Gastropoda*, but the pointed foot, the disposition of internal organs, the absence of any definite head and the structure of the embryo, approximates them to the *Pelecypoda*. Here is one of the many Molluscan puzzles waiting to be solved.

EUCALYPTUS NOTES.

By A. D. SERVICE.

FINNISS to SANDERGROVE, 4 miles, mean altitude about 125 feet, soil light sandy loam. A survey along the western side of the railway on 31st December, 1932.

Species observed: *E. angulosa*, Schau.; *E. fasciculosa*, F.v.M.; *E. gracilis*, F.v.M.; *E. dumosa*, Cunn.; *E. transcontinentalis*, Maiden; *E. oleosa*, F.v.M.; *E. calycogona*, Turcz.

The first quarter-mile from the Finnis station was under cultivation, with a row of well-grown *E. fasciculosa* along the edge. A large area of mallee scrub followed on a front of about $1\frac{1}{2}$ miles. The predominating species was *D. angulosa* (flowering freely; very occasionally the cream filaments were tinged with red at their base). Associated with it were *E. fasciculosa* (as a shrub, or rarely a stunted tree), *E. dumosa* and *E. gracilis*, an occasional patch of *E. transcontinentalis* (in flower), and very rarely *E. calycogona* (in fruit only; no buds seen). Cultivated land followed this and continued to the Sandergrove station, but there was a narrow belt along the edge consisting of *E. angulosa*, *E. fasciculosa* and *E. gracilis*. In the vicinity of the station, in addition to the last three, *E. dumosa* appeared, with a little *E. transcontinentalis* and one small patch of typical *E. oleosa* growing as a mallee about 12 feet high.

Variation in *E. dumosa* was marked, in one instance showing transition towards *E. conglobata*, R.Br. var. *anceps*. The *E. transcontinentalis* did not have the glaucous leaves of the type and might therefore have been referred to *E. oleosa*, but it is better included with the former species as it a well defined form with constant long-rostrate opercula, not at all characteristic of typical *E. oleosa*.

EXCURSIONS.

NATIONAL PARK, BELAIR, November 26th, 1932.

Exploration of the north-eastern corner was undertaken and many plants were noted in flower. The botanical survey was continued under the direction of Prof. J. B. Cleland, and several more species were added to the list of plants found here.

MR. W. BURDETT'S NATIVE FLOWER GARDEN, BASKET RANGE, December 3rd, 1932:

A large party motored to this garden which is considered to be the best of its kind in Australia. Mr. Burdett has many

hundreds of species of the native flora growing and the plots cover several acres. It is surprising how well the plants grow considering how poor the soil is in which they are planted. Mr. and Mrs. Burdett and family assisted in guiding the visitors and answering their questions about different species. Members were also entertained in the cherry orchard in which they were allowed *carte blanche*. Our host and hostess were sincerely thanked for the distinct privileges thus afforded to the members.

WILD LIFT SANCTUARY, HUMBUG SCRUB, January 30th, 1933:

A large party of members motored to the reserve which was commenced by the late Mr. T. P. Bellchambers and is now being carried on by his son, Mr. R. F. Bellchambers. The collection of animals and birds was greatly admired; kangaroos, wallabies, koalas, and many birds, including the mound-building birds, all seemed to enjoy life in their spacious surroundings. The outstanding fact that was impressed upon the members was the extraordinary tameness and contentment of the animals and birds. A white-winged chough was so tame that it came among the party and when given a morsel of bread flew up to one of the members and endeavoured to place it in his mouth. About 100 black duck were at home on the dam close to the homestead; they came to meet the party and showed no fear at all at such a large number of people.

There are over 40 Kangaroo Island wallabies in one enclosure, 12 scrub kangaroos in another, and 2 of the red variety in a third. All were quiet and exhibited no fear whatever at the intrusion of the party. The mallee fowls were seen and altogether 17 pairs are in the reserve. Mr. Bellchambers explained the use of the mound built by these birds and the manner in which the incubation takes place. Other native life seen consisted of 3 cockatoo parrots, 17 Cape Barren geese, 4 "Teddy Bears" (Koalas), 2 euros with a joey, 1 pair of teal, 4 black swans with 3 cygnets and one wood duck.

ALDGATE, November 5th, 1932.

There were about 12 members present on this trip, and Dr. R. S. Rogers was leader. The subject of study was orchids. A number were collected and formed the basis of a very interesting talk by the Doctor. A specimen of an African species (*Satyrium coriifolium*) was shown, which originally was brought from that continent and grown near Victor Harbor in a garden. It has now been found in limited numbers in the surrounding scrub. Of late years it has been ascertained that some orchid

roots and seeds are infected with a microscopic fungus. Dr. Rogers gave a short resume of the present knowledge gained in this direction and it proved a very fascinating subject.

WATERFALL GULLY RESERVE. November 12th, 1932:

The flora of the reserve was studied under the leadership of Prof. J. B. Cleland and several more species were added to the census which is being prepared for publication.

MR. S. HARVEY'S AVIARIES, KENSINGTON GARDENS, November 19th, 1932:

Members were privileged to see the extensive aviaries containing many native and foreign birds. Some of the exotic species were adorned with wonderfully gorgeous plumage and they were quite at home in the bush enclosures. Particular interest was centred in the very rare inland parrots and Mr. Harvey is the first one in Australia to be successful in breeding several species.

MR. GEISLER'S AQUARIUM, FLINDERS St., NORWOOD, January 28, 1933:

A large number of members availed themselves of Mr. Geisler's invitation and enjoyed the view of the large numbers of finny occupants of the cool waters. The whole of the tanks are kept in a wonderfully clean condition and the fish are healthy and active. Mr. Geisler has gone to great expense to secure fresh water fish from all parts of the world, and members were entertained by his informative talks on the various fish and on the management of aquaria. Members were delighted with the afternoon's outing in such cool surroundings.

A Wasp AND A SPIDER.

By W. DELLOW, Woodville, S.A.

On a fine Sunday afternoon in March, 1932, at Woodville, I noticed a disturbance on a load of sand in my yard and on going to investigate I observed a wasp, with yellow and black markings, dragging a spider along. The spider being larger than the wasp, made a heavy load, consequently the wasp had a difficult task in getting it along. Its efforts on the sand had made the fine particles fly in all directions and it was interesting to see the struggles of the carrier. It, however, eventually got off the sand and I followed the wasp for a distance of 30 yards when it disappeared down a hole in the middle of a flower bed.

Twice on the trip the wasp left the spider, apparently dead, on the ground and flew around as if to pick up its bearings as it was walking backwards while dragging its load.

**FIELD NATURALISTS' SECTION OF THE
ROYAL SOCIETY.**

Publications of the Section.

No. 1.—“The National Parks of Australia,” by Wm. H. Selway. (Out of print).

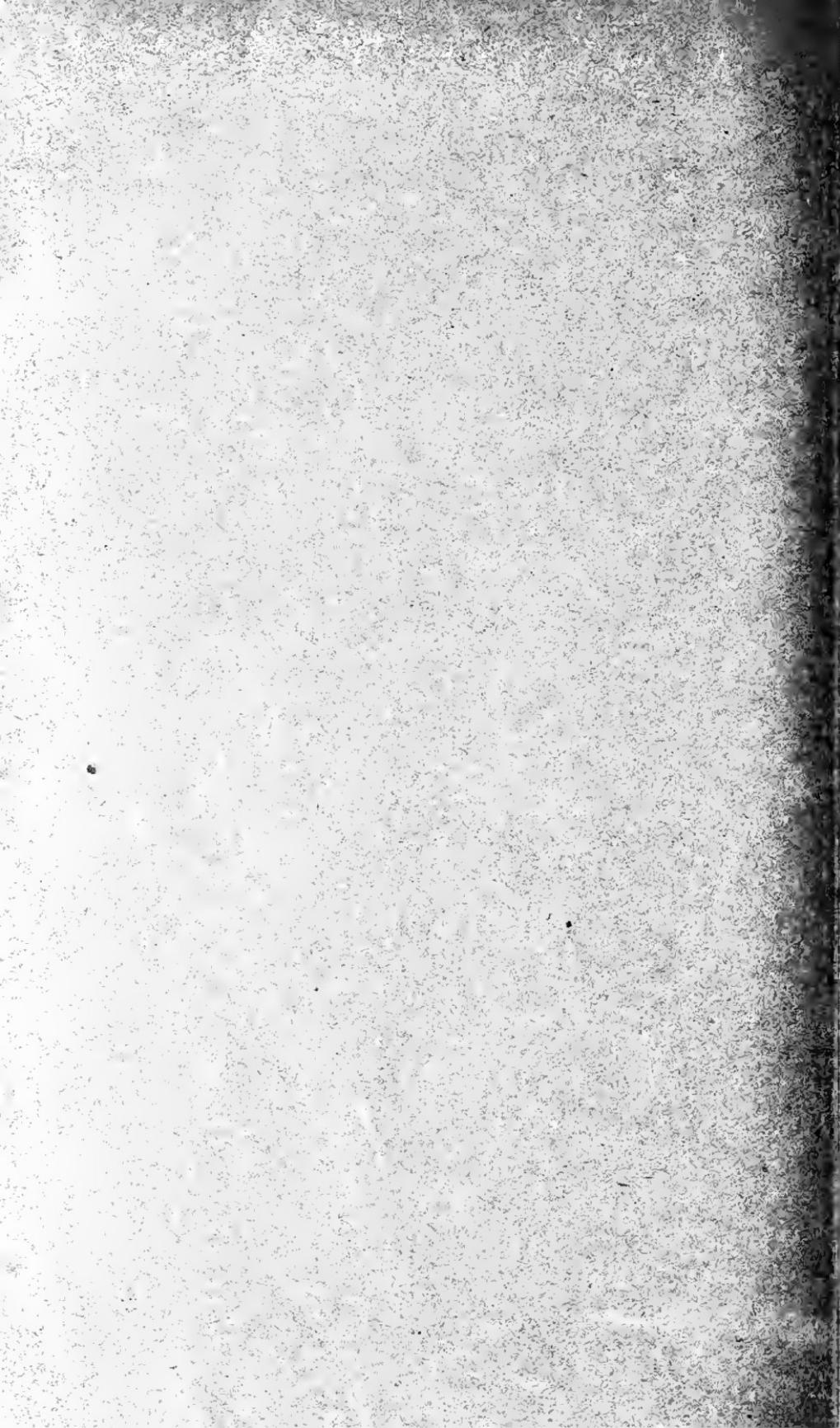
PUBLICATION NO. 2

GEOLOGICAL AND BOTANICAL NOTES
on the
VICTOR HARBOUR DISTRICT

by
PROF. J. B. CLELAND, M.D., and
PROF. WALTER HOWCHIN, F.G.S.

Published by Cole's Book Arcade,

Price 1/-.



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Adelaide



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No. 3

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Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. B. Cotton, the Museum, North Terrace, or with the Secretary, Mr. E. V. Dix, Harbors Board Office, Victoria Square. In the case of Motor Trips, ticket is to be paid for at time of booking.

EXCURSIONS.

July 1—Walking Tour. Leader, Mr. E. V. Dix, meet at T. & G., 2 p.m.

July 22—Eden Train, 1.15 p.m. Leader, Mr. W. Ham, Geology.

August 5—Henley South. Tram, 2 p.m. Leader, Mr. W. H. Selway. Sandhills Flora.

August 19—Semaphore. Train, 1.35 p.m. Leader, Mr. F. Trigg. Walk to Grange (4 miles) to study shells and shore life.

August 26—Little Para. Motor, 2 p.m. Leader, Mr. W. Ham. Physiography.

EVENING MEETINGS.

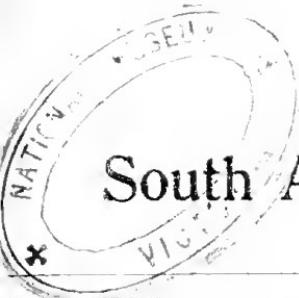
July 18—Lantern Lecture on "Eyres Rock and Mt. Olga, Central Australia," by Mr. H. H. Finlayson in the Lecture Room at 8 p.m.

August 15—Annual Meeting and Exhibits.

October 13 & 14—Wild Flower Show.

HON. SECRETARY.

As Mr. E. V. Dix has found it necessary to resign, Miss J. M. Murray has accepted the position, and all correspondence should be addressed to her at the Royal Society's Rooms, Institute Building, North Terrace.



The South Australian Naturalist.

VOL. XIV.

ADELAIDE. MAY, 1933.

No. 3.

PROCEEDINGS.

FEBRUARY, 1933.

This opening evening meeting of the year took the form of a Conversazione and members met for tea at 6 p.m. in the Women's Club Rooms. A large attendance of members and friends was experienced and the Chairman (Mr. E. H. Ising) presided. The following gave musical items:—Mr. and Mrs. Harold Pank, piano, 'cello and song; Mr. J. Pritchard, violin; Mrs. Kelsey, piano; Miss Kennedy and Mrs. Lower, songs.

NOMINATIONS.

1. Miss Limbert, 35 Austral Terrace, Malvern.
2. Mrs. F. Cordon, 63 Barker Road, Prospect.
3. Miss G. Lademann, 36 Sixth Avenue, Helmsdale.
4. Miss M. Lewis, 23 First Avenue, Joslin.
5. Mrs. Thomson, 23 First Avenue, Joslin.
6. Mr. Lyal Lush, 507 Edments Building, Rundle Street
As Honorary Members:—
 1. Mr. R. F. Bellchambers, Humbug Scrub.
 2. Mr E. E. Kramer, Alice Springs.

ELECTIONS.

1. Miss H. C. Hughes, Magill.
2. Mr. R. Buick, 16 Austral Terrace, Malvern.
3. Mr. J. E. Excell, 49 Halsbury Avenue, Kingswood.
4. Miss M. Moseley, 102 Kensington Road, Toorak.
5. Miss G. Williams, Pooraka.
6. Mr. W. M. Nielson, Pooraka.
7. Mr. B. Donaldson, 2 Ashwin Terrace, Torrensville.
8. Mr. & Mrs. L. J. Wicks, Highbury East.
9. Mrs. J. D. Robert, 21 The Grove, Woodville.
10. Miss M. Emerson, c/o W.E.A., University.

LECTURE.

A Trip to Europe and the Continent, by Mr. F. Trigg.

Mr. Trigg led his hearers through Italy, Spain, France, Switzerland and Germany and the pictures shown were excellent while the lecturer's remarks on each of them gave them a charm which was delightful. Altogether it was an outstanding evening, socially as well as intellectually and most enjoyable with the combination of musically gifted friends.

Messrs. Laubman and Pank kindly lent an epidiascope by the aid of which Mr. Trigg's pictures were shown, and also a large assortment of microscopes, etc.

MARCH, 1933.

The monthly meeting was held in the Royal Society's Room on 21st March, when Mr. E. H. Ising presided over a good attendance, and it was pleasing to note the number of long-standing members present.

NOMINATIONS.

Miss C. Eardley, 68 Wattle Street, Fullarton Estate.

ELECTIONS.

Miss Limbert, Mrs. F. Cordon, Miss G. Lademann, Miss M. Lewis, Mrs. Thomson, Mr. L. Lush, Mr. R. F. Bellchambers, and Mr. E. E. Kramer.

LECTURE.

Mr. L. A. Wells and Mr. R. Poyntz were introduced by the chairman, who referred to Mr. Wells's work as an explorer and especially to his work on the 1896-7 Calvert Expedition. Mr. Wells spoke of the great sandy desert principally. The desert country shelters some life through the growth of spinifex or porcupine grass (*Triodia irritans*) amongst which wallabies, rats, lizards, crickets, bandicoots and snakes live. But for the spinifex it would be entirely desert for 600 miles from Mt. Bates, 300 miles of this was done on camels at night time for coolness across the lines of sandhills. Mr. Wells spoke of the wonderful work of Carnegie, who crossed the great sandy desert only fourteen days after him, though about 150 miles from his route. Mr. Wells started out from Ooldea in April, 1932, and got into country where there had been no rain for twenty months. The camels had no ample supply of water for 400 miles. The whole country smelled of the dead rabbits. Eba Springs gave a supply at Mt. Davenport (about 100 miles from the Granites). During four and a half months the camels had only sufficient water on four occasions. Later the party were twelve days without water for the camels, several of which died as a result. Two years

ago Mr. Wells saw tens of thousands of shell parrots, and he thought that the bronzewing pigeons are increasing. Pictures were then shown of the land described.

Mr. R. Poyntz, one of Mr. Wells's companions on the last trip, then spoke, giving reminiscences and incidents, especially of the aborigines. He had visited Lasseter's Cave and saw Lasseter's last message in it. Mr. Poyntz also showed carvings in jarrah of several natives holding a corroboree, as well as several fossils and mineral specimens.

Mr. W. A. Harding then spoke on the microscope, simple and compound. The microscope reveals that many things are not what they seem to the naked eye. As illustrations he mentioned the colour of the butterflies' wings and the patterns of minute diatoms. It reveals the beauty and the marvels of God's handiwork in nature. Several slides were then shown by means of the projection microscope, including diatoms, polycistina, foraminifera and histological sections.

EXHIBITS.

Dr. W. Christie: Botanical specimens from Tasmania, including some from Mt. Wellington.

Mr. H. M. Hale: A specimen of the new pigface (*Carpobrotus Pulleinei*) named after Dr. R. Pulleine, and a parakeelia (*Calandrinia remota*), both grown by the exhibitor.

Mr. E. H. Ising: A specimen of mistletoe (*Loranthus miraculosus*, var. *melaleucae*) growing on tea tree near a lagoon at Macgillivray, Kangaroo Island, this being the second record of a mistletoe from the Island.

APRIL, 1933.

The monthly meeting was held on 18th April, when the chairman (Mr. E. H. Ising) presided.

NOMINATION.

Mr. Shinkfield, Meteorological Bureau.

ELECTION.

Miss C. Eardley.

LECTURE.

Professor J. A. Prescott, President of the Royal Society, gave a lecture on "The Main Soil Classifications of South Australia." Prof. Prescott said that the native vegetation is a good index to the soil. The aim in the United States and Australia is to survey an area and use terms than can be understood by the

settlers who eventually become interested and conduct researches of their own. The whole section of the soil is considered. Each variety of soil type demands different treatment. A soil map is plotted and becomes a valuable aid to the investigator and grower. Although a district may have good soil, it may hold six or more types. Mallee, red-brown earth, black deep soil (podsol), are three main types of soil. Most of the soil surveys done in South Australia are the districts along the River Murray where forty to fifty types have been recognised and described.

Prof. Prescott was heartily thanked for his highly instructive lecture and for the manner in which he delivered it. He exhibited a large series of soil types, which were glued on to laths in such a way as to show a section from the surface to a foot or more below. Soil maps of the Murray and Kuitpo Forest were also shown.

MAY, 1933.

The monthly meeting was held on 16th May, when the chairman (Mr. E. H. Ising) presided. Present were twenty-nine members and friends.

ELECTION.

Mr. Shinkfield.

JUBILEE.

After discussion, it was proposed by Mr. J. A. Hogan and seconded by Mrs. F. Cordon that the jubilee celebrations be held in conjunction with the Annual Wild Flower Show, on October 13 and 14, 1933.—Carried.

LECTURE.

Mr. H. M. Hale, Curator of the Museum, gave an excellent lecture on "Crabs and Prawns as Enemies and Friends of Man," and illustrated his remarks by a large number of lantern slides.

Mr. Hale mentioned how different species of crustaceans destroyed man's crops, his agricultural lands and in other ways. They also prey upon man's food supply in the shape of other fish. It was in this way they were definite enemies to man. On the other hand, there were ways in which other crustacean species proved themselves as friends to man. Some of them were used for food, others were food for other creatures which were useful to mankind, such as whales. By many other illustrations Mr. Hale made his lecture one of extreme interest and education and was warmly thanked at the close of it.

EXHIBITS.

Mr. H. M. Hale: A large number of crustaceans in illustration of his lecture.

Mr. B. C. Cotton: A series of shells of various families, and a range of Pectens showing the variation in size and colour, no two of which were alike in the latter respect.

Mr. H. Goldsack: A large collection of orchids excellently pressed and mounted of the families of *Pterostylis*, *Caladenia*, *Corysanthes*, *Prasophyllum* and *Diuris*, most of which came from the Coromandel district.

Mr. E. H. Ising: The very rare orchid *Prasophyllum fusco-viride*, which had been sent from near Cummins, Eyre's Peninsula. The only other locality from which this species had been collected was Ardrossan.

Mr. W. J. Kimber: A number of hermit crabs *in situ*, which were shown to inhabit various species of shells.

EXCURSIONS.

BLACKWOOD EXPERIMENTAL ORCHARD, February 18, 1933.

The Officer in Charge, Mr. R. Fowler, led the party around the orchard and explained the various sections of fruit trees and the manurial and other tests that were being carried out for the benefit of fruit growers.

ALDGATE FLOWER SHOW, March 11, 1933.

The Aldgate Flower Show was visited and members were delighted with the fine blooms that were on view.

MOUNT LOFTY FLOWER SHOW, March 18, 1933.

Under the leadership of Mr. A. J. Morison the Autumn Flower Show was inspected and many excellent flowers were admired by the members.

OUTER HARBOUR, April 1, 1933.

Mr. W. J. Kimber took charge of a party of shell enthusiasts to this favorite collecting ground and the leader gave much interesting information on the shells and the animals that inhabit them to be found in the vicinity.

VISIT TO HON. R. T. MELROSE'S HOME AT MOUNT PLEASANT, April 25, 1933.

A motor party travelled via the Gorge (the River Torrens valley), Guméracha, Birdwood to 3 miles beyond Mt. Pleasant. The members were delighted with the fine old garden with its

many trees and shrubs of Australian and exotic origin, and the extensive beds of flowers, the charming rock designs with their special plants and the creek flowing through the property. At every turn there were fresh beauties to be seen and many were the exclamations of delight as the party proceeded from vista to vista. It was felt by all that a very distinct privilege has been granted to our Section through Mr. Melrose's generosity in allowing our members to pay this visit; this privilege was appreciated very much. A large number of aviaries were situated close to the home and the inmates consisted of a large assortment of beautiful and rare birds, Australian and others. Situated along the banks of the creek were a number of large enclosures wherein were kept larger birds of many sorts.

In a large wire-netted run were seen about 20 deer, 3 emus, 5 kangaroos and 2 wallabies. One kangaroo was an albino form and another soon made friends with several of the party. These animals were quite contented in their extensive enclosure and were safe from harm as well.

The following native plants were observed on the property:— Sourso (Oxalis corniculata), Harebell (*Wahlenbergia gracilis*), Convolvulus (*C. erubescens*), and *Eryngium* sp. but not in flower.

The wool shed was visited before the party left.

On the return through the Torrens Gorge a stop was made and the Olive Gum (*Eucalyptus elaeophora*) was collected. A search was made for the rare violet shrub (*Hymenanthera angustifolia*) which grows in the Torrens bed somewhere in the Gorge, but it was not seen.

OSBORNE, LE FEVRE PENINSULA, May 13, 1933.

About 20 members took part in the outing which was led by Messrs. E. H. Ising (Chairman) and B. C. Cotton. On the walk from the Station to the beach the plant life was observed. It was regretful to see how the boxthorn was spreading which is let to increase without hindrance. The pig face (*Carpobrotus acinaciformis*) was common on the flats and it was explained how this plant stores water in the specially adapted leaves, thus being enabled to withstand the heat of summer on the dry sand. Other natives noticed were the berry saltbush (*Enchylaena tomentosa*) the Clematis (*C. microphylla*), sword rush (*Lepidosperma gladiatum*). When the sandhills were reached the following were seen:—*Scaevola crassifolia* with its specially thickened leaves, and rounded shape to act as a protection against the prevailing winds. *Leucopogon parviflorus* which seems to follow the sandhills along the coast, the silvery Spinifex trailers (*S. hirsutus*) a grass which makes a wonderful sand binder which

when undisturbed covers the dunes on the seaward side, the sexes are on different plants and the large round heads of female flowers are often seen blowing along the beach in summer; the dune *Geranium pilosum* develops a long tap root to enable it to live through the summer. Mr. Ising drew attention to the three separate plant formations in this district: (1) The Dune Flora, (2) The Mangroves along the riverside growing in brackish water and (3) The flats between these two. Mention was made of the hard conditions the dune flora has to contend with and the various adaptions perfected by the plant for overcoming these difficulties. The lack of oxygen in waterlogged soil, such as that in which the mangroves grow, was pointed out and the growth of special organs (pneumatophores) or pegs on the roots and produced above high water mark so as to allow oxygen supplies to be taken in by these parts was explained. A further "safety first" device of this species was the germination of the seed on the parent plant before becoming detached, by this means it would very easily germinate when it fell on the mud.

Mr. Cotton stated that LeFevre Peninsula was particularly rich in beach fauna. Such a diversity of habitat, mangroves, sea-weed, sand-flats and accumulations of rock, sheltered a corresponding range of beach life. Much remained to be done, as, compared with European beaches for instance, the peninsula was a virgin field. Many, even common shells found there, were wrongly named, their habits unknown and their animals undescribed. The common bait-cockles (*Chione scalarina* and others) found on the sand flats by the hundred, had never been thoroughly examined.

The interesting, air-breathing mollusc (*Salinator fragilis*), so common in the mangroves, still required a thorough description of the animal and a record of the many colour and shape varieties of the shell.

Many questions may be asked of our common *Conus* (*Conus anemone*). Why is there such a variation in the length of the spire? Is there more than one species confused under this name? Does the animal sting? This is only one of the thousand or more species, living on Le Fevre Peninsula, which await investigation.

 :o:

NOTICE!

Our special thanks are due to Sir Joseph Verco whose generosity enables us to reproduce the beautiful coloured plates of nudibranchs in this issue. This is the first time coloured plates have appeared in this publication. Dr. H. Basedow made the original paintings from living specimens.

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of new genus and species)

PART VII.

In this part the following families are treated:—

Architectonidae, *Heliacidae*, *Retusidae*, *Ringiculidae*, *Triclidiae*, *Akeratidae*, *Bullariidae*, *Aplustridae*, *Philinidae*, *Aglajidae*, *Cavolinidae*, *Spiratellidae*, *Tethyidae*, *Umbraculidae*, *Scyllaeidae*, *Aeolididae*, *Pleurophyllidiidae*, *Argidae*, *Doriopsidae*, *Polyceridae*,

ARCHITECTONICIDAE.

Architecton = master builder. Shell orbicular, depressed or trochiform; mouth entire, angular or subcircular; lip and columella simple, interior without nacre; umbilicus deep, usually wide, and usually with crenulated margins; main sculpture usually spiral; operculum horny, spiral. Distribution—World-wide, in warm seas. Fossil—Trias, maximum in the Tertiary. Few living species. The shells are not pearly like *Trochus*—which many of them resemble.

Animal with very large oval foot, notched in front; tentacles cylindrical, folded throughout their length, thick, with eyes sessile on swellings near their outer bases.

Philippia Gray 1847 (= *Disculus* Deshayes 1863). Conic, angular at the periphery; without axial sculpture, spiral sculpture nearly obsolete; protoconch minute, smooth; umbilicus small, deep. Operculum flattened; whorls numerous, with nucleus subcentral; internal face bearing a subspiral calcareous process. Type—*Solarium luteum* Lamarck 1822.

P. lutea Lamarck 1822 (*Solarium*). Pl. 1, fig. 1. “The Yellow Philippia.” Rather thin, conical; yellowish, with bands of small brown dots on the spirals above the suture and on the periphery; umbilical crenulations white; spiral sculpture, a fine smooth thread above the suture, and two cinguli on the periphery; base spirally finely striated; growth lines oblique, fine; spire conical, a little higher than the mouth, outlines slightly convex; protoconch minute, smooth; adult whorls five, regularly increasing, flatly convex, the last keeled; base flattish; suture but little impressed; mouth subquadangular; outer lip sharp; columella vertical, broadly rounded; umbilicus small, deep, margin crenulated. Height 12, diam. 15 mm. Rare. Gulf St. Vincent, St. Francis Island, MacDonnell Bay, Glenelg River, and

dredged Beachport 40 fathoms. Also Western Australia—Esperance, Ellensbrook, Albany. (Type locality—the seas of New Holland).

HELIACIDAE.

Description as *Heliacus*, the only genus of the family here recorded. Distribution—World-wide, tropical and subtropical. Fossil—Tertiary.

Animal possesses the essential features of *Architectonicidae*.

Heliacus d'Orbigny 1842. (= *Torinia* Gray 1840; = *Tereziapoma* Rochebrune 1881). "Sun Shell." Turbinately elevated, or planorbiform: protoconch paucispiral, smooth; adult whorls rounded, granulated, spirally ribbed; outer lip and columella simple; umbilicus moderate to wide, perspective, its margins slightly crenulated. Operculum horny, typically conically elevated, externally multispiral, margined by projecting edges; internal face smooth, bearing a spirally twisted median projection. Type—*Solarium heberti* Deshayes. *Heliacus* differs from *Architectonica* in having a nearly orbicular operculum, which is very convex and marked with a spiral ridge resembling a pagoda. The operculigerous lobe on the foot of the animal is cup-shaped when the operculum is removed, and the edges are elevated. The species affect deep water, and are very shy and sensitive when observed.

H. foveolatus Tate 1893 (*Torinia*). Pl. 1, fig. 2. "The Widely-umbilicated Sun Shell." Turbinate, depressed, slightly convex; semitransparent-white; penultimate whorl has four spiral riblets (of which one in the lower-third is the strongest), and slightly oblique axial threads, (nearly as stout as the largest of the spirals); the intersection of the spiral and axial threads produce rhombic pits, within which are a few spiral striae; the largest spiral riblet is granulated at the intersections with the axials; body-whorl has a gemmulated keel, the medial portion of the upper surface has two gemmulated ribs of about equal magnitude, at the suture there is a double smaller rib, and there is a finer one above the periphery; below the periphery are about five spiral equal-sized ribs, more or less gemmulated at the intersections of axial sigmoidal threads; the umbilical wall has about five flat threads crossed by lamella-like striae; whorls four, of rather slow increase; last whorl angulated at the periphery; base rounded; suture impressed; mouth quadrately rounded; umbilicus deep and wide. Height 1.75, diam. 5, diam. of umbilicus 2.5 mm. (Type locality—Aldinga Bay and Semaphore). The conspicuous oblique ribbing and very wide umbilicus distinguish it.

H. stramineus Gmelin 1791 (= *T. fulva* Hinds). "The Straw-coloured Sun Shell." Convex, uniform yellowish-brown; axially striated, spirally grooved and ribbed, ribs broad and flat; suture profound; umbilicus wide, ribbed at the border, rib crenulated, umbilical wall with or without spiral ribs. Diam. 25 mm. Gulf St. Vincent, one fragment. King George Sound W.A., 35 fathoms, one alive (Verco). (Type locality—Tranquebar, Philippines). Also recorded from New Guinea. The older authors gave the East Coast of Africa as the habitat of *H. stramineus*, but afterwards a small shell agreeing with this species in sculpture and colour, and differing only in size, was found in the Mediterranean and identified by Philippi as the same shell. Cantraine, considering the difference in size and the widely separated habitats has made the Mediterranean shell a distinct species and named it *T. sicula*. At the best, Cantraine's species is but a variety, of which *T. fallaciosa* Tiberi is a synonym.

RETUSIDAE (= *Tornatinidae*).

Spiral, cylindrical or fusiform, capable of containing the soft parts; spire short or sunken and concealed; protoconch more or less turned over; mouth long and narrow, wider below; columella with or without a fold; umbilicus, if present, very narrow; no operculum. Distribution—World-wide. Fossil—Cretaceous. Animal with the foot shorter than the shell, entire behind; head-shield short, quadrangular, produced in two erected processes behind, near the bases of which are the eyes; gizzard with three oval tuberculate plates.

Retusa Brown 1827. *Retusa* = blunt. Subcylindrical, imperforate, with slightly raised, flat or depressed spire; mouth almost or quite as long as the shell, narrow above, dilated below; columella thickened, with a small fold or none. Type—*R. obtusa* Brown.

R. amphizosta Watson 1886 (*Utriculus*). "The Girthed Retusa." Rather broadly cylindrical, but contracted in the middle, and broadest below the contraction, bluntly rounded in front; translucent white, with trace of spiral bands; axial striations faint, close, feeblest on the base; spiral striations, regular, with delicate spiral scratched lines; top of shell flat, but slightly depressed; protoconch papillate, small; whorls four, of which only the small rounded tops are seen on the crown, where they are slightly and radiately ridged; suture impressed, distinct; mouth as long as the shell, rounded below, long, narrow, rounded above; outer lip bends outwards below the middle; columella with a slight fold and a narrow patulous edge, with a scarcely noticeable

umbilical depression behind it. Height 3, diam. 1.5 mm. St. Francis Island 6-20 fathoms. Also Western Australia—Bunbury, King George Sound, 15-28 fathoms. (Type locality—Flinders Passage, Cape York, North Australia, 7 fathoms). Very like *Utriculus truncatulus* Brugiere, but that has much stronger axials, no spirals, and an oblique crown, sloping down from left to right, on which side the top of the mouth and outer lip rise in a rounded loop, very considerably above the top of the body-whorl.

R. eumicra Crosse & Fischer 1865 (*Bulla*). Pl. I, fig. 3. Subcylindrical, thin; shining; somewhat transparent, white; smooth; spire nearly flat, but the protoconch forms a very small projecting button. Whorls three-and-a-half, last whorl large, almost equal to the whole of the shell; mouth narrow, but enlarged towards the base. Height 4.5, diam. 2 mm. Common, Gulf St. Vincent and Spencer's Gulf. (Type locality—Spencer's Gulf. Somewhat allied to *R. pussilla* Sowerby (*Bulla*), but distinguished from it by the absence of any umbilical cleft, by its greater length, its shape a little more elongated and more cylindrical, and its spire whorls flat, with the exception of the apical button, which is very prominent.

R. apiculata Tate 1879 (*Utriculus*). "The Sunken-spired Retusa." Similar to *R. eumicra* Crosse & Fischer, but distinguished by its sunken spire, the papillary protoconch being exserted beyond the level of the body whorl. The upper part of the body-whorl, immediately below the suture, distinctly convex. The lower extremity of the shell is more gradually tapering, and the shoulder of the body whorl is less abruptly arched, consequently *R. apiculata* is more fusiform than its ally. It is also much larger. Height 15.5, diam. 7 mm. Type locality—King George Sound, W.A.)

R. apicina Gould 1859 (*Tornatina*) (= *T. brenchleyi* Angus 1877; = *T. mariae* Tenison-Woods 1876; = *Utriculus aenarius* Watson 1886; = *Bulla fusiformis* Adams 1854). Ovately cylindrical, elongated; shining, white, growth lines very delicate; only faint traces of spiral striation; protoconch mamillated, small, of two whorls; adult whorls two-and-a-half, somewhat elevated, turreted; suture deeply but not broadly channelled; mouth three-fourths the length of the shell, narrow above, gradually dilating and curved at the base; outer lip not extending to the top of the whorl, and slightly contracted in the middle; columellar fold obsolete. Height 5, diam. 2 mm. Gulf St. Vincent: St. Francis Island 6-20 fathoms. (Type locality—Sydney Harbor).

R. hofmani Angas 1877 (*Tornatina*). "Hofman's Retusa."

Cylindrical, white; growth lines very fine; spiral striae, few, distant, irregular, discernable toward the lip on the body whorl; protoconch sharp; whorls five-and-a-half, the upper adult whorls slightly convex; last whorl a little shouldered above and very slightly concave in the middle; suture channelled; mouth narrow above, dilated below, and rounded at the base; outer lip thin, arched when viewed laterally, and slightly contracted in the middle; columella somewhat thickened below, with a small blunt flexuous projection near the base, and covered by a callus extending nearly to the top of the whorl. Height 7, diam. .3 mm. Dredged—St. Francis Island, 35 fathoms. (Type locality—Sow and Pigs Reef, Port Jackson).

R. complanata Watson 1886 (*Utriculus*). "The Levelled-spire Retusa." Cylindrical, truncated and flat on the top, very much and obliquely truncated in front; white; axial furrows on the lines of growth, strong, curved; spiral furrows over the whole surface, sharp, irregular, parted by flat intervals of about three times their width; protoconch glossy, depressed, mamillated; whorls three, convex, on the top of the shell they are rounded; suture impressed; mouth the full length of the shell, narrow above, oblong and roomy in front, club-shaped; outer lip rises roundly just above the top, its course is straight with a very slight concavity; columella oblique, nearly straight, patulous; Height 1.25, diam. .7 mm. St. Francis Island, 15-20 fathoms, one specimen, which agrees with a specimen from 5-10 fathoms. Hope Island, Queensland. (Type locality—West of Cape York, off south-west point of Papua, 28 fathoms, green mud).

R. hacketti sp. nov. Pl. I, fig. 4. "Hackett's Retusa." Small, fairly solid, of aque-white; cylindrical, attenuated in anterior half; the posterior part of the shell is the widest part; vertex quite flat, except for the prominent mucronate protoconch; adult whorls three; last whorl rises very slightly above the vertex; when viewed from the dorsum, the anterior part on the left side (with the anterior end upwards) is a little excavated, instead of being convex; mouth narrow, dilated and rounded below; outer lip straight. Type—Height 4, diam. 2 mm. Gulf St. Vincent, 10 fathoms. (Reg. No. D.10659 S. Aus. Mus.). Also dredged Backstairs Passage, 10 fathoms. Vertex may be very slightly sunken. Somewhat like *R. complanata* Watson, but distinguished by its prominent mucronate protoconch. Rather larger and much more solid than *R. kimberi* Cotton & Godfrey (below), and less variable in form. Named after Mr. W. Champion Hackett, a keen naturalist and past chairman of the Field Naturalists Section of the Royal Society of South Australia (Inc.).

R. kimberi sp. nov. Pl. 1, fig. 5. "Kimber's Retusa." Small, fairly thin, ovately cylindrical, translucent; axial growth lines, distinct, sublenticular; no spiral striae, spire very slightly prominent, and the small protoconch is also slightly prominent above the spire whorls; adult whorls three; last whorl nearly the total length of shell, slightly convex, with a regular dorsal curve anteriorly; mouth club-shaped, narrow above, gradually widening in a graceful curve to its bulbous anterior; outer lip bulges slightly in its anterior third and does not reach quite to the back of the previous whorl. Type—Height 3, diam. 1.4 mm. Gulf St. Vincent, 10 fathoms. (Reg. No. D.10660 S. Aus. Mus.) Also dredged, Backstairs Passage from deep water. Related to *R. hacketti* Cotton & Godfrey, but distinguished in being smaller, thinner, and having a slightly elevated spire, bulging outer lip and a fuller antero-posterior dorsal curve. Most specimens have no spiral bands, but some of the juveniles show traces of broad or narrow spiral opaque bands on the translucent shell. Named to honour Mr. W. J. Kimber, for several years chairman of the Shell Club (now the Malacological Society of S.A.), and an ardent Shell Collector for 40 years.

Cyllichnina Monterosato 1884. Small, subcylindrical, imperforate; spire slightly raised, flat or depressed; mouth nearly or quite as long as the shell, narrow above, dilated below; columella thickened, with a small fold or none. Type *Bulla umbilicata* Montagu.

C. atkinsoni Tenison-Woods 1876 (*Cyllichna*). "Atkinson's Cyllichnina." Cylindrical, narrow, thin, ferruginous; dull white, faintly striate both axially and spirally; spire umbilicate; hidden; outer lip thin, acute, drawn in at the middle, and subdilate anteriorly; inner lip narrow, reflexed. Height 4.5, diam. 2 mm. S.A., St. Francis Island, 6-20 fathoms; Cape Wiles, 100 fathoms. Western Australia—King George Sound to Fremantle, beach to 35 fathoms. (Type locality—Long Bay, Tasmania, 10 fathoms sandy bottom). Young shells are covered by dense undulating transverse striae.

C. pygmaea A. Adams 1854 (*Bulla*). Pl. 1, fig. 6. "The Pygmaean Cyllichnina." Small, subcylindrical, contracted in the middle, apex umbilicated; white, shining; axially striated, otherwise smooth; mouth narrow, linear, dilated below; outer lip produced above, rounded, inflexed in the middle; inner lip subcallous below. Height 5, diam. 2.6 mm. Backstairs Passage and Gulf St. Vincent westward to Bunbury W.A.—Beach and down to 35 fathoms. Not uncommon. (Type locality—Port Lincoln). Very variable. One form is cylindrical, centrally

contracted; spirally striate and banded with spiral lines of opaque beyond the spire and towards the axis, anteriorly; pyriform. The shell may be smaller, more oval—little or not at all centrally contracted; spirally striate and banded with spiral lines of opaque white square spots. Another form is scarcely, if at all, inflated below. The shape may be fusiform, narrowed posteriorly and the backwards projection of outer lip angular.

Rhizorus Montfort 1810. Small, solid; ovately-cylindrical, with oblique, sunken spire; mouth longer than the body of the shell, narrow, entire somewhat dilated at both ends; outer lip much prolonged, medially straight, sharp, turning into the cavity of the spire. Type—*R. adelaidis* Montfort (Italy). Many authors give *Rhizorus* as a synonym of *Volkula* A. Adams. We think this is probably incorrect as *Volkula* is one of the *Ovula* forms.

R. rostratus Adams 1850. Pl. I. fig. 7. "The Beaked Rhizorus." Elongately oval, beaked at both ends; white, pellucid; axially sub-striated, spirally very minutely striated; mouth narrow, linear; outer lip equally arched; columella tortuous with a single fold. Height 7, diam. 2.6 mm. Fairly common and generally distributed from Beachport S.A. to King George Sound and Hopetoun W.A.—beach and down to 104 fathoms. (Type locality—Port Lincoln, S. Aus. Mus. Metcalfe).

R. tragula Hedley 1903 (*Volkula*). "The Drag-net Rhizorus," from its net-like sculpture. Thin, oblong-acuminate; milk-white; spiral grooves, fine, medially almost effaced, posteriorly about half-a-dozen are deeply incised; axial growth lines faint; mouth as long as the shell, posteriorly it narrows to a canal, anteriorly is broad and effuse; inner lip terminates below in a spike; columella forms at base a broad ear-shaped lobe, with a thickened edge. Height 4, diam. 1.65 mm. Gulf St. Vincent, Spencer's Gulf, Tourville Bay. (Type locality—Port Kembla N.S.W. 63-75 fathoms). The South Australian shell is probably either a variant or distinct species. More specimens are necessary to determine this. Hedley records a series in the Australian Museum, Sydney, giving the species a range of sixteen degrees of latitude.

RINGICULIDAE.

Short, ventricose, spire conic of several whorls; mouth narrow, obstructed by folds on the columellar margin; outer lip thickened outside, often dentate within. No operculum. Distribution—Tropical and subtropical. Fossil—Cretaceous. Animal completely retractile within the shell, foot short, head-disc wide, prolonged backward in the middle, a sort of siphon being formed by the rolled-in margins.

Ringicula Deshayes 1838. Small, solid, ovate-globose; nearly white; spire conical; mouth from one-half to three-fourths the shell's height, conspicuously notched and channelled at the base; outer lip thickened and often dentate or crenulate within, margined with callus outside; columellar margin heavily calloused, with two to four strong entering folds. Type—*Auricula ringens* Lamarck.

R. australis Hinds 1844. "The Southern Ringicula." Oval, rather thick, white; smooth throughout (as originally described), or regularly spirally incised, about eight incisions in the penultimate whorl; spire elevated; whorls five-and-a-half, moderately convex; last whorl, longer than the spire, rounded, and attenuated at the base; mouth contracted, somewhat ear-shaped, margins united by a strong callous deposit forming a projecting tubercle; outer lip thick, reflected; inner lip dilated, with two folds, the stronger adjoining the base. Height 3, diam. 1.65 mm. Not uncommon. Backstairs Passage and Gulf St. Vincent, westward to King George Sound W.A.—beach and down to 55 fathoms. Some specimens from St. Francis Island are more elate but varying greatly in length. One from Sceales Bay is larger and subscalar in the spire. (Type locality—Port Lincoln S.A.). Fresh specimens smooth throughout are rare.

R. meridionalis Hedley 1911. "The Meridional Ringicula." Ovate, thin, the more solid parts opaque white, the less solid translucent pearl grey; spiral ribs, flat topped, with shallow spiral grooves between, sixteen on last whorl (some specimens have the ribbing closer); spire elevated; protoconch bulbous; whorls five, convex, last ventricose; mouth oval; outer lip thickened forming a slight external varix, smooth within; columella with two strong folds, above which a callus thick-spread on the body whorl projects a broad, blunt tubercle into the aperture. Height 2.5, diam. 1.65 mm. Dredged—Cape Wiles, Cape Jaffa, Neptune Islands, 100-130 fathoms. (Type locality—40 miles south of Cape Wiles S.A., 100 fathoms). *R. australis* Hinds, is larger but proportionately narrower.

R. semisculpta Hedley 1911. Rather large and thin for the genus, ovate-globose, glossy, subtranslucent; growth lines fine, microscopic; spiral scratches, few, on shoulder; half-a-dozen widely spaced spiral grooves on the base; protoconch tilted; sub-immersed; whorls (including protoconch) five, rounded; suture impressed, bordered by an opaque line; outer lip thickened in a low varix, not dentate, sinuate posteriorly, insertion rising a little above the line of the suture; inner lip spread on the body whorl in a thick callus, but without any tubercle; columella with two

prominent, deeply entering folds, the lower larger and projecting beyond the canal. Height 5, diam. 3.5 mm. Dredged—Beachport to Cape Jaffa, 90-300 fathoms. Type locality—100 fathoms, forty miles south of Cape Wiles, South Australia). South Australian adult specimens have a prominent triangular tooth inside the outer lip opposite the interval between the columellar folds, and a long inflected edge further back, and a minute denticle between the two, also a low, wide, basal tubercle on body whorl midway between the upper fold and the back of the aperture. Younger shells are thinner, without the labral denticle and the basal tubercle is almost obsolete.

R. denticulata Gould 1860. "The Denticulated Ringicula?" Ovate, acuminate, solid, milk-white, spiral striae, close (narrower ones being sometimes intercalated); whorls five, ventricose; mouth narrow; lip thickened, denticulate within, nearly interrupted at siphonal sinus, folds transverse, acute, callus moderately, hardly appressed, the parietal tooth moderate. Height 5, diam. 3.5 mm. Dredged—Neptune Islands, 104 fathoms. Also Western Australia—West of Eucla, 50-100 fathoms, and Mandurah. (Type locality—Port Jackson).

R. hardingi sp. nov. Pl. I, fig. 8. "Harding's Ringicula." Ovate, turreted, solid, white; spiral incisions strong, numerous, crowded, about thirty in the body whorl, with one stronger spiral just below the suture; spire somewhat elevated; protoconch of two whorls, slightly turreted, somewhat oblique, smooth; adult whorls three, slightly convex; mouth rather narrow, obliquely ovate; outer lip thickened, smooth; two columellar and one parietal fold. Type—Height 4, diam. 2.5 mm. Locality—130 fathoms off Cape Jaffa S.A. (Reg. No. D.10662 S. Aus. Mus.) Spire turreted, shorter than in *R. australis* Hinds. and longer than in *R. semisculpta* Hedley. The strong spiral below the suture will help to distinguish it. Named after Mr. W. A. Harding, an ardent microscopist, Chairman of the Microscope Committee, a subsection of the South Australian Field Naturalists.

Pugnus Hedley 1896. "By its thrice folded columella, anterior canal, thickened outer lip, a sculpture of spiral grooves crossed by transverse striae, this very distinct genus takes a place in the family *Ringiculidae*. From the only other surviving genus *Ringicula*, *Pugnus* is separated by its involute shell and buried spire. In the shortness of the spire the Cretaceous fossil *Avellana* occupies a position intermediate between these two. Its contour is however, more globose, and those subordinate groups which agree with *Pugnus* in possessing a smooth lip, appear to differ by having one columella plication only. The type and only species is *P. parvus* Hedley" (Hedley).

P. parvus Hedley 1896. Pl. 1, fig. 9. Minute, solid, oblong, white, involute, spire buried, imperforate, the posterior of the inner portion of last whorl obliquely sloped; spiral grooves, about thirty, whose intersectices are three times their breadth, and are cut by axial striae into squarish facets; mouth as long as the shell, vertical, contracted in middle, expanded above and below; outer lip smooth, thickened externally and internally, springing from a false umbilicus in vertex, arched higher than it; arcuate peripherally, curving below the whorl up to the columella and channelled at junction; inner lip overlaid with callus; anteriorly the columella bears a strong entering fold, posterior and parallel to which is a weaker one, and posterior to this again a small deeply seated third fold is just distinguishable. Height 1.5. diam. 1 mm. (Type locality—Manly, N.S.W., alive, at low tide on rocks, and dead in shell sand from Middle Harbour).

TRICLIDAE (= Scaphandridae).

Spiral, spire sunken or concealed. The form of the shell is so various that no useful diagnosis of the family can be drawn from it. Distribution—World wide. Fossil—Cretaceous. Animal with a short cephalic shield, truncated posteriorly; no tentacles, eyes deeply embedded; epirodial lobes well developed, three calcareous stomachal plates, two broad and paired, one narrow and single; they are not tuberculate. Carnivorous. Sexes united.

Cyllichnella Gabb 1873. Small, moderately solid, subcylindrical, the spire sunken and umbilicate or closed and concealed by the calloused inner lip; smooth or with spiral striae; mouth as long as the shell, narrow above, expanded and effuse below, lined base; columella rather thickened, simple or somewhat sinuous; outer lip receding towards the suture. Type—*Bulla bidentata* d'Orbigny.

C. arachis Quoy & Gaimard 1833 (*Bulla*). Pl. 1, fig. 10. Solid, cylindrically elongate, obtuse at both ends; periostracum cinnamon; white; spiral striations very delicate; umbilicate; mouth very straight; peristome clear white; columella thick; rounded below. Height 24. diam. 9 mm. Not uncommon and generally distributed, from Beachport S.A. to Bunbury W.A. beach, and dredged to 150 fathoms. (Type locality—King George Sound W.A.)

C. thetidis Hedley 1903 (*Cylichna*). "The Thetis Cyllichnella." Narrow, elongated, cylindrical, thin; glossy, white; spiral incised lines, fine, close; growth lines hardly perceptible; narrowly umbilicate, partly roofed by a callous arch; mouth as long as the shell, narrow above, expanded and effuse below, lined on inner side by callus; columella oblique, slightly twisted, thickened, with a slight angle below; inner lip narrow, with a

furrow on the outside. Height 11.5, diam. 4.5 mm. Dredged—Beachport S.A., to Bunbury W.A. 12-110 fathoms. (Type locality—N.S.W. Manning River 22 fathoms and Port Kembla .63-75 fathoms).

C. protumida Hedley 1903 (*Cyllichna*) (not *C. pyramidata* A. Adams). "The Anteriorly-swollen Cyllichnella." Narrow, long in the waist, inflated rather suddenly at the anterior third, rounded anteriorly, obliquely truncated at the vertex; pale yellow; growth lines, faint, cut by spiral lines: fine, sharp, incised, which are distinct above and obsolete medially; mouth the full length of the shell, medially constricted to a slit and opening below in a pear-shaped expansion; body-whorl overlaid by a sheet of callus; columella slightly curved, broad inner margin subdenticate, outer reflexed; vertex pierced by a narrow, deep, axial, perforation. Height 5.4, diam. 2.3 mm. Dredged—Beachport S.A., to Rottnest Island W.A., 50-300 fathoms. (Type locality—Cape Three Points N.S.W. 41-50 fathoms). Flindersian examples are not typical, they are wider and obsoletely sculptured.

Roxania Gray 1847. Small, ovoid, solid, spirie umbilicate; decussately striate, transversely profoundly sulcate, the sulcations strongly punctuate; mouth narrow, dilated in front; inner lip sharp, truncate below; outer lip produced above. Type—*Bulla canchii* Fleming 1828.

R. exigua A. Adams 1854 (*Atys*). Pl. 1, fig. 11. "The Scant Roxania." Elongately oval, posteriorly narrowed; white, shining; axial striations, very fine; mouth narrow, linear, dilated below; outer lip produced above, flexuous; columella thin, rather tortuous; inner lip subsallous. Height 10, diam. 4 mm. Not common. Beach—Grange, Glenelg, Port Willunga, Wallaroo. Dredged—St. Francis Island, 15-35 fathoms. (Type locality—Port Lincoln).

R. parvula A. Adams 1854 (*Atys*). "The Minute Roxania." Oval, white, shining; spiral striations throughout, close, very minute; mouth widened below; outer lip arched, posteriorly produced, anteriorly dilated; inner lip slightly tortuous, subtruncated. Height 3, diam. 2 mm. Very rare in South Australia. (Type locality—Port Lincoln).

R. hordeacea A. Adams 1854 (*Atys*). "The Barley Roxania." Oval, narrow at the ends, ventricose above the middle; white, shining; spiral striations throughout, strong, striae rather wide apart; mouth narrow; outer lip arched above the middle, posteriorly produced, anteriorly rounded; inner lip anteriorly strongly twisted, subtruncated. Height 5, diam. 3 mm. Very rare. Beach—Streaky Bay. (Type locality—Port Lincoln).

AKERATIDAE.

Oval or cylindrical, thin and fragile, elastic: light yellow-brown or green tint; with entirely exposed nearly level spire, deep sutural slit, and wide fasciole. Distribution—Most Seas. Fossil—Tertiary. Animal not completely retractile, with long narrow head disc, large parapodial lobes reflexed over the shell, and many cartilaginous stomach-plates. The young use the parapodial lobes as swimming organs.

Akera Muller 1776 *Akeros* = hornless. Ovate, or oval-cylindrical, thin, fragile, elastic, with exposed nearly level spire of several whorls; last whorl acutely keeled at the shoulder, the keel bounding a flat anal fasciole; mouth nearly as long as the shell, narrow above and extending in a deep sinus along the suture, dilated below and very effuse, permitting all the whorls to be seen from the base through the spirally ascending columella; columella very concave, thin, with narrowly reflexed edge. Type—*Akera bullata* Muller (British).

A. soluta Gmelin 1791 (*Bulla*). Large, fragile, cylindrical, tapering towards the ends; periostracum thin, pale yellowish-brown; spiral striations dense; spire slightly projecting, obtuse, a terrace of shoulder of whorls, acutely keeled, a flat, wide anal fasciole between keel and the deeply impressed suture; protoconch minute, uptilted, half immersed; whorls nearly five; body whorl forming most of the shell; mouth narrow in its upper half, with a wide posterior sinus extending back about a third of the whorl, lower half dilated ovate, effuse at the base; outer lip fragile, arching forward in the middle; columella very concave, with a narrowly reflexed cord-like edge. Height 45, diam. 25 mm. Port Lincoln, Hardwicke Bay, Spencer's Gulf. (Type locality—Zanzibar). Peters records this species from Querimba Is., Lienard from Mauritius, Cuming from the Philippines and Torres Straits, Angas from New South Wales.

A. tasmanica Beddome 1882. "The Tasmanian Akera." Minute, globosely oblong, imperforate, thin, glossy; brown, darker tinted above, with a narrow white band near the shoulder and a wider one in the anterior-third; spire truncated, flush with the upper margin of the last whorl, separated by a channelled suture, terminated by a hyaline bulbous protoconch; last whorl inflated, as long as the shell, rounded at the shoulder; mouth contracted above, enlarging anteriorly to the arched front; outer lip truncatedly angled posteriorly; columella arched, simple. Height 1.9, diam. 1.2 mm. Guichen Bay, Gulf St. Vincent. (Type locality—Brown's River Road, Tasmania, 7 fathoms).

A. bicincta Quoy & Gaimard 1833 (*Bulla*). Pl. 1, fig. 12. "The Two-banded Akera." Ovate-oblong, very thin, fragile; white, encircled by two reddish-bands; axial and spiral striations;

suture fissured. Height 25, diam. 17 mm. Dredged Gulf St. Vincent 5 fathoms. Also Albany W.A. (Type locality—King George Sound W.A.) Has almost entirely the form of the fragile *A. bullata* Muller, (the type of the genus, a British species) only the outer lip is more developed and the mouth wider below.

BULLARIIDAE.

Globose, oval, or oblong-cylindric, vertex umbilicated (rarely covered) and sunken spire, mottled colour-pattern, and smoothish surface; mouth as high as the shell, rising above the vertex, narrow above, dilated below; columella concave, simple, with reflexed crescent callus, no fold. Distribution—Warm and temperate seas. Fossil—Cretaceous. Animal completely retractive, with a large head-disc, truncated in front, bilobed behind, bearing eyes about the middle; no epipodial or parapodial lobes; foot long, tapering behind; stomach contains three dumb-bell-shaped chitinous plates. Sexes united. Herbivorous.

Bullaria Rafinesque 1815 (= *Bulla* Linne 1758). Oval, compactly involute, generally solid and with mottled colour-pattern; spire sunken, umbilicated; mouth as high as the shell, rising slightly above the vertex, its upper portion narrow, expanded towards the base; outer lip simple, flexuous; columella short and concave, with a crescentic white reflexed callus; parietal wall smooth, with a light callus. Type—*Bulla ampulla* Linne. Species of this genus inhabit sandy mud-flats, the slimy banks of river-mouths and brackish places near the sea; at low water some conceal themselves in the mud and under seaweed, exuding large quantities of mucus to maintain the moisture of their skin.

B. botanica Hedley 1918 (new name for *B. australis* Gray 1825: not *B. australis* Ferussac 1822: = *B. oblonga* A. Adams 1854). Pl. 1, fig. 13. "The Herbivorous Bullaria." Oval-cylindric, rather thin, shining; yellowish-brown, marbled with darker, sometimes spirally banded; growth lines distinct, flexuous, oblique; spiral striations very fine and dense, the striae distinctly wavy; spire sunken, vertex with a narrow deep, not perspective, umbilicus, with spiral striation; body whorl elongate-oval, narrowed above, convex, but somewhat flattened on the last half-turn; base rounded; mouth high, extending beyond the spire, narrow above, enlarged toward the base; outer lip thin, sharp, narrowly rounded above, flatly convex in the middle; basal lip regularly arched; columella short, concave; inner lip reflexed over the pillar. Height 50, diam. 33 mm. Common along the whole South Australian shore line: also Western Australia to Bunbury. Beach and dredged to 28 fathoms. (Type locality—King George Sound W.A.) Many cast up alive at Stansbury, Yorke Peninsula, also in the mud of Onkaparinga River above Port Noarlunga town.

bridge. The species attains to 67 mm. in length by 40 in breadth, and is sometimes proportionately broader, 65 x 40 (illustrated). The S.A. form is rarely that with the very narrow posterior end and the centrally compressed labrum, but the *oblonga* form of A. Adams. Over the lower fourth of the body whorl are about eight to twelve well marked spiral incisions, three to five of them are subdistant, the rest crowded around the basal lip. Sometimes two broad well defined whitish bands encircle the shell, one above and one below the middle, each with a central dark line shaded off on one side.

B. tenuissima Sowerby. "The Very Thin Bullaria." Ovate-oblong, subcylindrical, subpellucid, very thin; pale brown, variegated with subquadrate, dull brown spots, principally arranged in four rows; outer lip rather straight; columella margin white, flat, arched, narrow; umbilicus wide. Height 23, diam. 13 mm. One fragment, Levens Beach (Cotton). (Type locality—Swan River W.A.) Remarkable for the thinness of its semi-transparent texture.

ATYIDAE.

Shell brittle, with concealed spire; a posterior sinus, but no sutural slit or anal fasciole; the interior not wholly visible from base. Distribution—Most Seas. Fossil—Miocene. Animal with a quadrate head-disc, bilobed behind; epipodial lobes large, reflexed over the shell; three principal cartilaginous stomach-plates. Herbivorous. Sexes united.

Haminoea Turton 1830 (= *Haminea* Gray 1847). Thin, fragile, corneous, globose, ovate or cylindric-oval, spire sunken and concealed, vertex concave, imperforate or minutely perforate; periostracum thin; mouth as long as the shell, broadly rounded below, narrow above; columella concave, thin, its edge narrowly reflexed, with a slight fold where it joins the body of the shell; lip retreating above but without a distinct sinus. Type—*Bulla hydatis* Linne 1758 (British).

H. brevis Quoy & Gaimard 1833 (*Bulla*). Pl. 1, fig. 14. "The Short Haminoea." Rather solid, cylindrical, truncated at both ends; white; smooth, except for about twenty spiral striations on the base; growth lines microscopic; vertex somewhat sunken but not umbilicate; mouth quite wide throughout its length. Height 18, diam. 10 mm. Fairly common. Yankalilla Bay S.A. and west to Albany W.A., beach, and dredged to 15 fathoms. (Type locality—King George Sound W.A.) Animal white, stomach containing three oblong deeply toothed plates. Shells taken by Sir J. C. Verco at Albany beach, 10 mm. in length,

have all of them the spiral lines in front, very few have the rest of the shell smooth, most have similar spirals at the posterior part and some over the whole surface; so these spirals will not distinguish *cuticulifera* from *brevis*.

H. tenera Adams 1850 (*Bulla*). Obliquely suboval, horny, pellucid, axially strongly striated, rather green, with very minute spiral lines; outer lip straight, posteriorly rounded. Height 13, diam. 8.5 mm. Beachport S.A. to Rottnest Island W.A. Fairly common in beach shell sand. Apparently a shallow water form. Type locality—uncertain. Pilsbry gives various localities—Suez (Cooke), Mauritius (Lien, Möbius), Reunion (Deshayes). If this is the same species as *H. vitrea* A. Adams (as Cooke thinks) then priority applies and the name becomes *H. vitrea* Adams = *tenera* Adams 1850.

H. cuticulifera F. A. Smith 1872. Elongate-cylindrical, above and below roundly quadrate, thin; white, buff tinged toward base and vertex, uniformly light horny when fresh; periostracum very thin, shining; growth lines, fine, flexuous; spiral linear grooves, rather distant, fine, closer together and more distinct on base; vertex impressed, imperforate, the lip reflexed at the centre body, whorl cylindrical, narrowly angularly rounded above, straight in the middle, base flatly convex; mouth as high as the shell, narrow above, scarcely produced above the vertex, widened below; outer lip produced and angularly rounded above; almost straight at the middle; columella short, rather straight, with the inner lip reflexed over it. Height 14, diam. 6.5 mm. Rare. Streaky Bay, Venus Bay. (Type locality—Port Jackson N.S.W.) The lateral outlines of this species are nearly straight; the superior striae are about six in number, the inferior about eighteen. *H. brevis* Quoy & Gaimard is a shorter shell with more convex outlines.

H. cymbalum Quoy & Gaimard 1833 (*Bulla*). "The Cymbal Haminoea." Globose, polished, translucent, white; growth lines very faint; spire rounded, sunken but not umbilicate; mouth wide, rounded below, somewhat contracted above; outer lip somewhat expanded and slightly incurved. Height 14, diam. 11 mm. Kangaroo Island and Spencer's Gulf, to the westward. Beach, not uncommon. (Type locality—Guam). This species has been reported by various authors from such distant localities as Japan, New Caledonia, Mauritius, Reunion, Querimba Islands; some may be incorrect. South Australian specimens are probably only a smoother, more delicate form of *H. brevis* Quoy & Gaimard.

APLUSTRIDAE.

Spire usually short, last whorl inflated; mouth distinctly effuse below, columella somewhat thickened, rarely twisted, but always anteriorly truncated. Distribution—Tropical and subtropical, chiefly Coral Reefs, East Indies. Fossil—Jurassic. Animal, head with the frontal disc produced into large ear-like tentacular lobes folded back over the back of the shell, and furnished with bifid labial appendages; eyes sessile at the inner bases of the tentacular lobes; mantle with the inner margin thin and membranous, the outer forming a thick, fleshy lobe, curving round the spire of the shell; branchial plume long and single; foot large and membranous, auriculate in front, rounded behind.

Aplustrum Schumacher 1817. Aplustre, the carved stern of a ship with its ornaments. Shell oval, thin, vividly coloured banded; covered with a thick horny periostracum; spire wide, depressed; columella truncated at the base, the aperture notched there; outer lip sharp. Type—*Bulla aplustre* Linne (Philippines).

A. brazieri Angas 1877 (*Diaphana*). Pl. 1, fig. 15. "Brazier's Aplustrum." Subglobose, thin; hyaline; periostracum olive, fine, membranaceous; spire flatly depressed; whorls three-and-a-half, rounded above; last whorl inflated; suture impressed; mouth contracted above, subovate below; outer lip sharply angled posteriorly, slightly sinuous, arcuate below; columella abruptly truncate below the long, narrow, open umbilicus. Height 4, diam. 3 mm. Very rare in South Australia. Dredged—Neptune Islands, 104 fathoms. (Type locality—"Sow and Pigs," Port Jackson in four fathoms, sandy mud, on weeds). Shell like *Diaphana*, but columella abruptly truncated below. Pilsbry introduced section *Austrodiaphana*, type—*D. brazieri* Angas, which Hedley considered should rank as a subgenus, (*Austrodiaphana* Pilsbry, Man. Conch. XV., p. 287).

PHILINIDAE.

Shell capable of containing but a small part of the body, entirely internal, covered by the reflexed and united mantle; whitish, fragile, of one or two whorls; spire sunken or absent, mouth extremely large, the outer lip often produced in a lobe or point above. Distribution—All seas, from low-water mark to a depth of about 1,000 fathoms. Fossil—Cretaceous. Animal with the body oblong, the head-shield having no tentacular processes, provided with sessile eyes or without them; foot truncated or rounded behind; parapodial lobes very large and conspicuous, more or less folded over the back.

Philine Ascanius 1772. Ovate, or squarish, thin, fragile, translucent, pale-coloured; smooth spirally striate or punctuate, or latticed; spire sunken; whorls few, loosely coiled, which are

entirely open from below; mouth very large, broadly effuse below; outer lip retracted, joining a wide sinus above; columella thin; arcuate. Type—*P. quadripartita* Ascanius 1772 (British Isles). The egg-capsules are gelatinous, hydrophanous, ovate, containing very numerous eggs arranged in single file, on a very long funiculus, folded in a loose spiral. The embryo has a spiral shell, an operculum, and is capable of swimming by means of a ciliated veil. The animals of this genus are blind, like most creatures that seek their food by burrowing. They frequent mud-flats, the surface of which they perforate and probe with their flattened heads for the small bivalves which constitute their prey; these they seize and swallow entire, breaking their shells by means of their testaceous, muscular gizzards. In all seas, from the shore-line to moderate depths. Jeffreys, commenting on the name of the genus, stated it should be *Phylline*, if derived from the leaf-like appearance of the shell; but that name was given by Oken to a genus of parasitic Annelids.

P. angasi Crosse 1865 (*Bullaea*) (not *P. aperta* Linne 1767, from Cape of Good Hope). Pl. I, fig. 16. "Angas's Philine." Oval, rounded and manifesting a little concavity at the centre of its summit, convex and almost cylindrical outside, rolled up inside; thin, transparent, somewhat glistening, milk-white; growth striae exceedingly fine and a little rugose; mouth very broad in the middle and at the base; outer lip semicircular simple, acute, and exceeding the rest of the shell a little; inner lip in adults covered with a callosus deposit, thin, white and transparent. Total length 40, greatest diameter 30 mm. Generally distributed in South Australian waters, not uncommon, beach and dredged to 10 fathoms. (Type locality—Gulf St. Vincent). It is probable that, like *P. aperta*, this shell in the water, and in the living animal, is quite transparent, and without colour, and that it only takes later the milk-white tint. The stomachal plates are very solid, and affect the appearance of a three-cornered hat. The English shell is now accepted as *P. aperta quadripartita* Ascanius, but was formerly considered to be identical with *P. aperta* from South Africa. Jeffreys gave the distribution of *P. aperta* as from Upper Norway to the Canaries, the Mediterranean, Adriatic and Aegean Seas, at from 4-110 fathoms; specimens from Cape of Good Hope, Australia, and New Zealand appearing to be specifically identical and stated that he had in vain attempted to discover a single distinguishing character, especially in regard to the South African shells.

P. columnaria Hedley & May 1908. Trapezoidal oblong, thin, transparent, milk-white; spiral scratches fine, close, crossed by irregular, inconspicuous growth lines; mouth broad below, narrow above, the summit arched, projecting beyond the spire,

inserted below the top of the last whorl; outer lip edge simple; inner lip defined by a thick layer of callus, at the base of which is a small umbilical groove; centre of summit occupied by a shallow pit margined by a groove, but the protoconch is concealed by a layer of callus spreading from the suture. Length 6.5, breadth 5 mm. Dredged—Beachport and Cape Jaffa, 40-200 fathoms. (Type locality—100 fathoms off Cape Pillar, Tasmania). Some specimens show two spiral bands, one about the middle of the shell, the other about half-way between this and the apex, less opaque than the rest of the shell, and sometimes constricted along these lines and swollen between. Hedley stated the Cape Pillar individuals showed the same variation.

P. evoluta Verco 1909. "The Unrolled Philine." Small, thin, short, subquadrate, milky-white; spiral lirae, numerous, flat, low, about one-third the width of their interspaces, obsolete at the vertex, more crowded in the middle; growth striae and undulations, subdistant; vertex very little narrowed, not umbilicated, showing three-quarters of a whorl, flatly convex; mouth very wide, widely sinused above; outer lip thin, produced in a roundly-anguliar lobe above the vertex; columella deeply and uniformly concave; inner lip a moderately wide glaze; umbilicus minute, rimate. Height 4.3, diam. 3.5 mm. Named from a unique dead specimen dredged in 130 fathoms of Cape Jaffa. Appears to be the only specimen in the South Australian Museum collection.

P. beachportensis Verco 1909. "The Beachport Philine." Oval, milky-white; spiral lirae, crowded, flat, separated by incisions, widest in the central half, more crowded towards the base, most crowded in the posterior fourth; growth striae, fine, cross the spirals and distinctly punctate the incisions; apex sunken; vertex with a triangular callus projecting from the inner lip; from apex of callus a lamina borders the back of the mouth, and a second runs round the middle of the apical pit to the outer lip, the two enclosing a gutter narrowing outwardly; mouth wide in front, narrow behind, with a narrow posterior sinus; outer lip simple, thin, straightly convex in profile; basal lip uniformly curved; columella concave; inner lip with a defined, well-spread glaze, ending behind in a callus. Height 18.2, diam. 8.1 mm. Dredged—Beachport, Cape Jaffa, 130-300 fathoms, all dead. (Type locality—200 fathoms off Beachport).

P. oscitans Hedley 1907. "The Gaping Philine." Small, moderately solid, oblong-ovate, opaque; pale yellow; spiral rows of small close punctures, radially undulate with rather coarse growth lines; spire not concealed, plane, of two-and-a-half rapidly increasing whorls, separated by a deep sutural furrow; mouth very large, rounded below; outer lip free at the vertex, ending in an acute angle; columella with a heavy callus. Height 2,

diam. 1.6 mm. South of Cape Wiles in 100 fathoms. We have not seen specimens. (Type locality—800 fathoms, thirty-five miles east of Sydney. *Philine trapezia* Hedley is related but is narrowed, thin, and possesses a distinct and characteristic angle.

AGLAJIDAE (= *Doridiidae*).

Shell very thin, fragile and degenerate, wholly internal, posterior and generally composed of a minute spire with a single free whorl; sometimes wholly membranous, sometimes partly calcified, rarely wholly calcified. Distribution—All tropical and warm temperate seas. Fossil—(doubtful). Animal bearing two dorsal shields, with a furrow between them, the anterior shield has free margins but not usually developed into tentacles, the posterior has the margins less developed, but is produced behind into two processes; foot broad, truncate before and behind, and continued on each side into a fairly ample parapodium, from which it is not clearly divided; parapodia divided behind, the posterior part of the body hangs over or rests on them; organs analogous to rhinophores are often present in the form of lamellae under the sides of the head-shield or lumps with bristles around the mouth; branchia a large bipinnate plume, posterior and on the right side. No jaws, radula, or stomach-plates; there is, as a rule, a large, sometimes colossal, buccal bulb with thick muscular walls.

Aglaja Renier 1807. The shell description is that of the family. Type—*A. tricolorata* Renier. Distribution—Mediterranean, east coast of Africa, Australasia, Japan, Sandwich Islands, west coast of Americas, West Indies.

A. troubridgensis Verco 1909. Pl. 1, fig. 17. "The Troubridge Island Aglaja." Shell detached, depressed conic, of about two-and-a-half whorls: apex somewhat lower than the rest: inner margin not uniformly curved, thick, opaque white to an irregular depth varying from two to four millimetres; outer part thin, translucent, with a membranous edge; surface irregularly corrugated by obliquely retrocurrent folds, which roughen the inner margin; internally somewhat rugose. Greatest diam. 21, smallest 15, height 21 mm. (Type locality—Troubridge Island, S. Australia, among the rocks; animals collected by Miss Fraser; shells only preserved. This species and *A. marmorata* Smith 1884 (Queensland), are the only representatives of the family in Australia, according to the various lists of Australian shells published to date.

A. lineolata listed and figured by H. & A. Adams 1858 from Australia (Gould), the shell of which is unknown, is recorded here in the hope that it may be localised later. "No description (of *A. lineolata*) has been published to my knowledge. As figured by A. Adams, the shields and outside of parapodia are transversely lineolate with purplish on a light brown ground;

insides (?—inner sides) of parapodia very dark; posterior wings of mantle short, without a filament. Shell unknown. Australia. (Gould)."

CAVOLINIDAE.

Shell external, calcareous, inoperculated, bilaterally symmetrical, not rolled up in a spiral, but at its apex often dorsally recurved. The shell has a variable form, which may always be referred to as a hollow cone, more or less modified, flattened dorso-ventrally or circular in section; apex quite straight, recurved, or truncated; mouth broad or narrow; ribs axial or spiral. Initial portion of the shell, generally distinct from the rest, represents the protoconch. Distribution—High seas, in all latitudes, very numerous in the tropics, floating constantly in the water by means of the lateral fins. Fossil—Palaeozoic. Animal, entirely retractile within the shell, with pallial cavity ventral, columellar muscle dorsal, anus situated on the left; the form of the fins and of the posterior lobe of the foot varies considerably.

Cavolina Abildgaard 1791. Generally horny-brown colour, especially characterized by its much contracted aperture, which is, however, very broad transversely; the lateral portions of this aperture, which are narrower than the middle part, are almost separated from it by a more or less developed tooth arising from the ventral lip and fitting into a dorsal depression; dorsal lip, which is longer than the ventral, is always more or less ventrally recurved; ventral lip, much recurved dorsally, is constricted a little in front of the aperture and then reflected ventrally; ventral surface always bulging. The special form of *Cavolina* depends on the fact that the sides of the shell diverge abruptly outwards, so that the lips appear much prolonged anteriorly; the sides of the shell are often prolonged into a more or less projecting point. The embryonic shell is not separated by a distinct constriction. Type—*C. natans* Abildgaard.

C. inflexa Lesueur 1813 (*Hyalaca*). "The Curved Cavolina." Elongated, conical, compressed on each side, elongated posteriorly, terminated by a recurved point, laterally armed with a short point; mouth ovately transverse, laterally deeply cleft. Height 6, diam. 4 mm. Neptune Islands, 104 fathoms. Two examples. Localities—Atlantic, Pacific and Indian Ocean.

The distinguishing feature of this species appears to be the upper lip directed straight forwards.

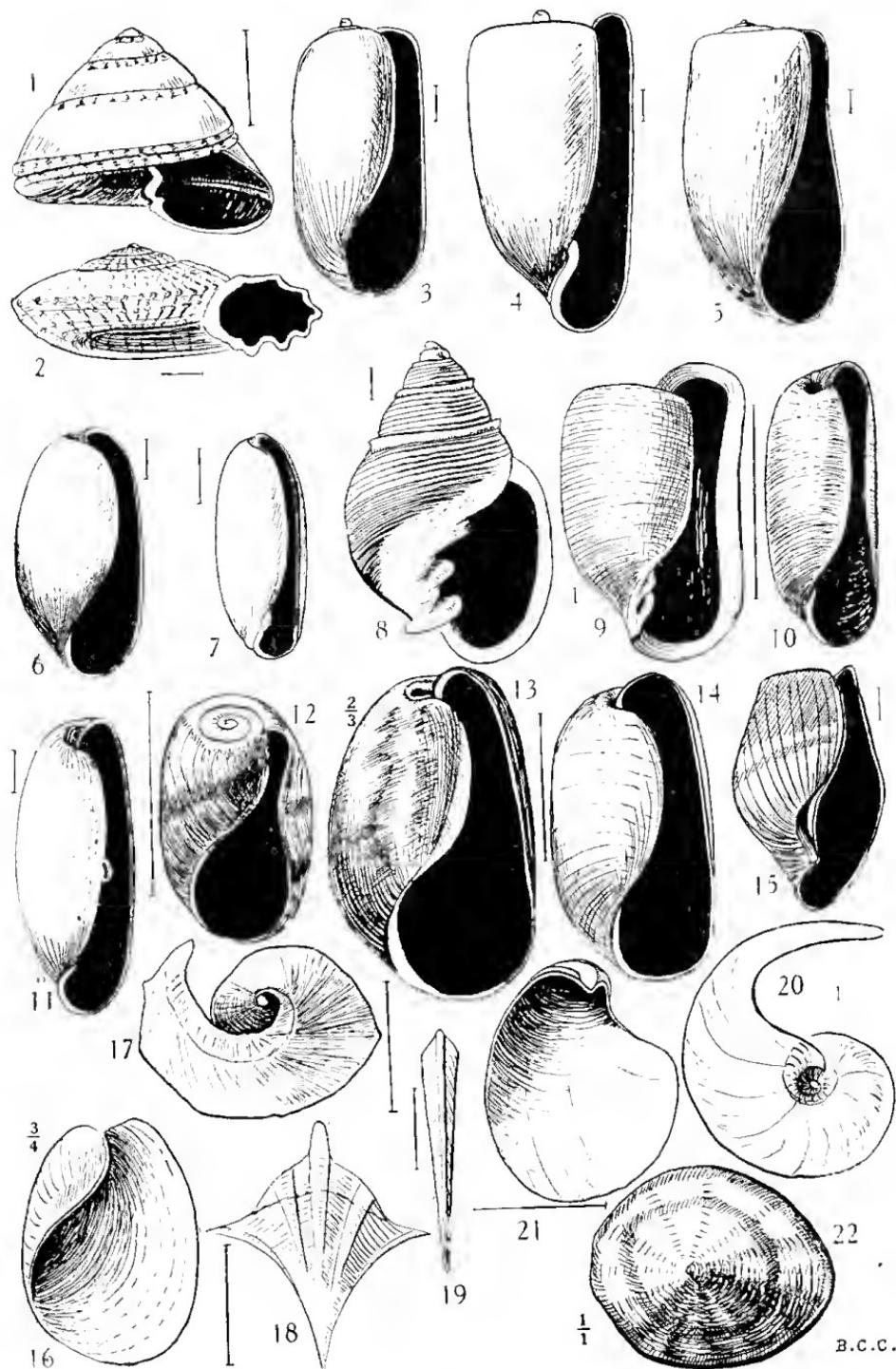
C. telemus Linne 1758 (*Monoculus*) (= *Anomia tridentata* Pelseneer 1888). Globular, thin, pellucid, yellowish, transverse striations very fine; hinder central process short, terminal tooth longer than the lateral ones. Height 15, diam. 12 mm. Cape Jaffa 300 fathoms, Beachport 110-150 fathoms. Neptune Islands

EXPLANATION OF PLATES.

PLATE I.

- Fig. 1. *Philippia lutea* Lamarck.
Fig. 2. *Heliacus foveolatus* Tate.
Fig. 3. *Retusa eumicra* Crosse & Fischer.
Fig. 4. *Retusa hacketti* sp. nov.
Fig. 5. *Retusa kimberi* sp. nov.
Fig. 6. *Cylichnina pygmaea* A. Adams.
Fig. 7. *Rhizorus rostratus* Adams.
Fig. 8. *Ringicula hardingi* sp. nov.
Fig. 9. *Pugnus parvus* Hedley.
Fig. 10. *Cylichnella arachis* Quoy & Gaimard.
Fig. 11. *Roxania exigua* A. Adams.
Fig. 12. *Akera bicincta* Quoy & Gaimard.
Fig. 13. *Bullaria botanica* Hedley.
Fig. 14. *Haminaca brevis* Quoy & Gaimard.
Fig. 15. *Iplustrum brasieri* Angas.
Fig. 16. *Philine angasi* Crosse & Fischer.
Fig. 17. *Aglaja troubridgensis* Verco.
Fig. 18. *Clio pyramidata* Linne.
Fig. 19. *Styliola subula* Quoy & Gaimard.
Fig. 20. *Spiratella inflata* Blainville.
Fig. 21. *Tethys norfolkensis* Sowerby.
Fig. 22. *Umbrella corticalis* Tate.

PLATE I.

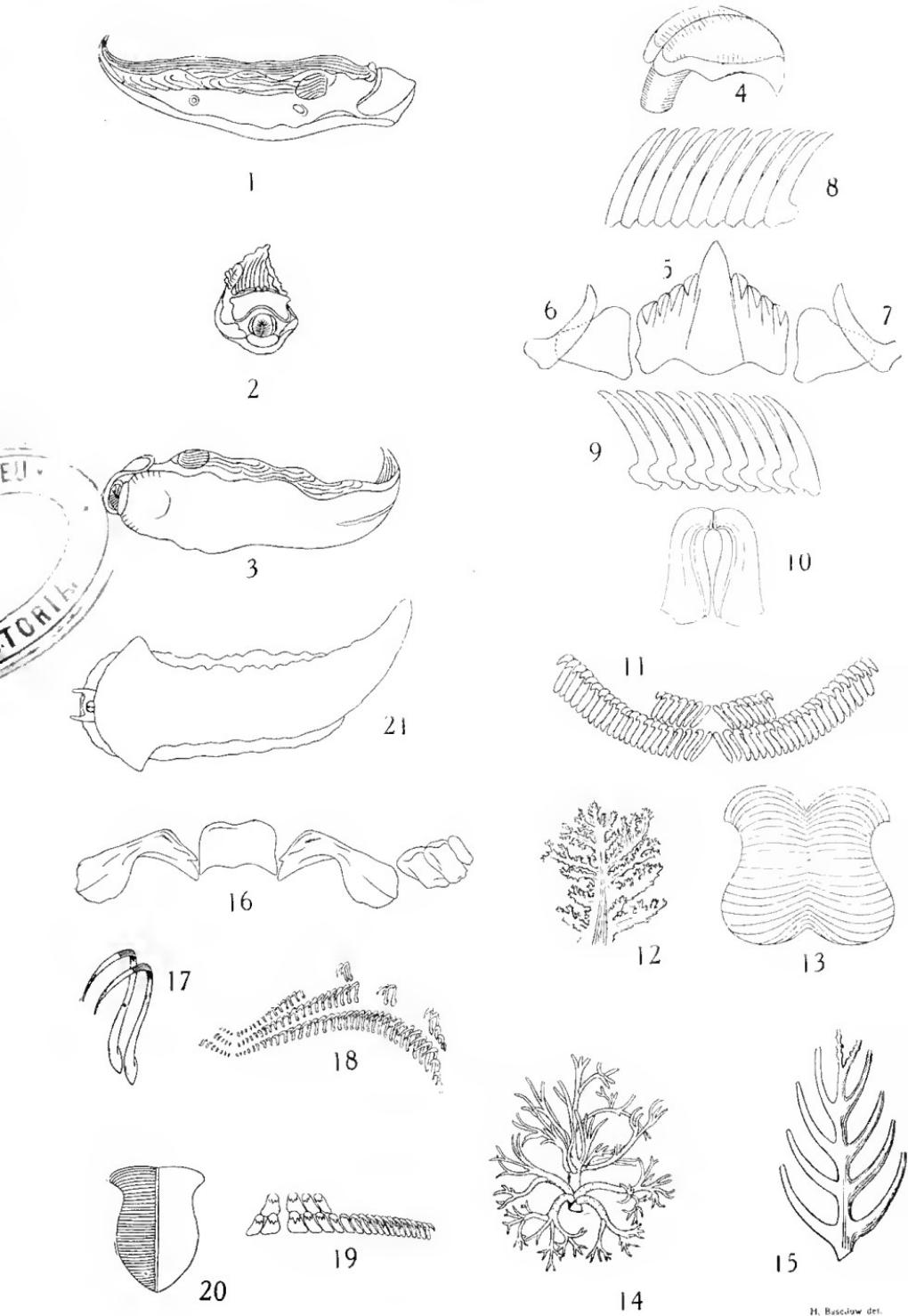


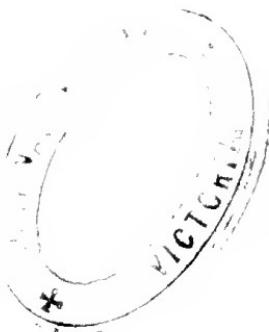
B.C.C.

PLATE IV.

- Fig. 1. *Pleurophyllida cygnea* Bergh. Lateral view.
- Fig. 2. *Pleurophyllida cygnea* Bergh. Front view.
- Fig. 3. *Pleurophyllida cygnea* Bergh. Ventral view.
- Fig. 4. *Pleurophyllida cygnea* Bergh. Arrangement transverse rows of teeth on the radula.
- Fig. 5. *Pleurophyllida cygnea* Bergh rachidian cusp with its denticles.
- Fig. 6-7 *Pleurophyllida cygnea* Bergh. Accessory plates connecting the rachidian with the laterals.
- Fig. 8. *Pleurophyllida cygnea* Bergh. Lingual spines, exterior aspect.
- Fig. 9. *Pleurophyllida cygnea* Bergh. Lingual spines, interior aspect.
- Fig. 10. *Pleurophyllida cygnea* Bergh. Mandible.
- Fig. 11. *Archidoris varia* Abraham. Teeth from the radula.
- Fig. 12. *Archidoris varia* Abraham. An enlarged branchia.
- Fig. 13. *Archidoris varia* Abraham. Radula.
- Fig. 14. *Ceratosoma brevicaudatum* Abraham. An enlarged branchia.
- Fig. 15. *Hypselodoris epicuria* Basedow & Hedley. An enlarged branchia.
- Fig. 16. *Nembrotha verconis* Basedow & Hedley. Row of teeth from radula.
- Fig. 17. *Halgerda graphica* Basedow & Hedley. Enlarged teeth from the radula.
- Fig. 18. *Halgerda graphica* Basedow & Hedley. Teeth from the radula.
- Fig. 19. *Aethodoris verconis* Basedow & Hedley. Teeth from the radula.
- Fig. 20. *Aethodoris verconis* Basedow & Hedley. Radula cross lines representing transverse rows of teeth.
- Fig. 21. *Hypselodoris epicuria* Basedow & Hedley. Ventral view.

PLATE IV.





104 fathoms. Also west of Eucla 80-300 fathoms measuring 17 mm. x 13 mm. Numerous specimens. This species is without appreciable lateral points. Localities—Atlantic, Pacific and Indian Oceans.

Diacria Gray 1847. Shell tricuspidate, the terminal point long; with lateral slits opening into the cervical aperture. Type—*Hyalaea trispinosa* Lesueur 1821.

D. trispinosa Lesueur 1821 (*Hyalaea*). "The Three-spined Diacia." Depressed, straight, kite-shaped; anterior extremity, or the portion above the acute lateral spines, is much shorter than the posterior end; the latter produced into a very long and slender straight caudal spine; transparent white, brownish near the lips and at the commencement of the tail; mouth short, narrow, semi-elliptic; marginal fissure extending to the lateral spines is linear; both lips abruptly reflected; upper and lower surfaces of shell nearly equally convex, mostly without marked concentric striae; upper surface projects semicircularly beyond the straightish labial edge of the lower; upper surface with a broad rounded central axial fold, generally divided in front into three smaller ones, flanked on each side with a strong narrower fold; lower surface with a slight fold adjacent to each lateral spine. Beachport to Neptune Islands, 90-300 fathoms. Numerous specimens. Also Western Australia, 80 miles west of Eucla, 80 fathoms, measuring 7 mm. x 6 mm. Localities—Atlantic, Indian, Pacific Oceans, and Mediterranean.

Clio Linne 1767. Clio, a daughter of Oceanus. Shell pyramidal, compressed at the sides, and ridged lengthwise, or spinous; mouth wide, angular. Type—*Clio pyramidata* Linne 1767. Animal triangular, ending in a long spike. Jeffreys, referring to this genus, quotes from Shakespeare—"Brighter than glass, and yet, as glass is, brittle." He further adds that *Clio* is perhaps the only phosphorescent kind of Pteropod.

C. pyramidata Linne 1767. Pl. 1, fig. 18. "The Pyramidal Clio." Triangular, convex in front, slightly concave on the back, abruptly sloping to a fine point, extremely thin and fragile, quite transparent, and lustrous; clear white; lengthwise ridges, five, in front, symmetrical, the outermost and largest, the central one intermediate in size between those and the other two; one ridge also at the back; dead shells exhibit numerous transverse and flexuous striae, especially on the back; nucleus spearhead or sharply ovate, separated by a very narrow line from the rest of the shell, mouth arched in the middle and sloping with a gentle curve to each side. Length 15, breadth 13.5 mm. Cape Jaffa, and 35 miles S.W. to Neptune Islands, 90-300 fathoms. Also 80 miles W. of Eucla, 80 fathoms. This species is reported as

fossil at many stations, including the older and newer Pliocene near Messina, and so far apart as Trontheim and Havannah. Observers have reported that a living specimen, on being put into fresh water, ejected a bluish liquid, with a strong smell of varnish. It is a beautiful triangular shell of the thinnest crystal. Localities—Cosmopolitan.

C. balantium Rang 1834 (*Cleodora*). Triangular oblong, glassy; posterior inflexed above; transversely sulcated above and below; inflated in the middle, sides compressed; dorsum with three longitudinal ribs which converge posteriorly; aperture ovately transverse, narrowing to the sides. Length 28, breadth 16 mm. Dredged—Beachport, Cape Jaffa, S. Aust., also Western Australia, 120 miles west of Eucla, 110-300 fathoms. Localities—Atlantic Ocean, Indian Ocean, southern portion, and off N. Guinea.

Styliola Lesueur 1825. Conical, straight, considerably elongated; surface smooth, with a dorsal groove not parallel to the axis of the shell, but slightly oblique, turning from left to right, with only the anterior extremity (which ends in a rostrum) in the median line; embryonic portion only vaguely separated from rest of shell, and ending in a pointed apex. Type—*S. recta* Lesueur (? = *Clio subula* Rang). Many conchologists have regarded *Crescis* Rang 1928, as a synonym. This opinion is based on a misinterpretation of the typical species, *Styliola recta* Lesueur, (without description) which has been taken by these authors for *Clio acicula*. But the description given of the genus *Styliola* enables one to infer that *Styliola recta* is really *Clio subula* and not *Clio acicula*. Structural features show *Styliola* more nearly related to *Clio* than to *Crescis*. On the contrary, forms included in the latter genus have retained some more archaic characters of the *Limacinidae* (Pelseneer).

S. subula Rang (*Cleodora*). Pl. I, fig. 19. "The Tapering Styliola." Conical, much elongated, obliquely truncated anteriorly, and terminated posteriorly by a slightly swollen point; very fine transverse striations all over; dorsal surface with a small groove from the anterior edge obliquely to near the summit; mouth rounded, oblique to the axis of the shell, irregular and sharp at the edge; upper lip, which is produced beyond the lower, terminates on the middle line in a point, more or less projecting, forming sometimes a kind of beak which is only the prolongation of the dorsal groove. Length 10, breadth 1.5 mm. Dredged—Cape Borda, Neptune Islands, Cape Jaffa, also 80 miles west of Eucla 62-300 fathoms. Localities—Apparently common in every ocean.

SPIRATELLIDAE.

Very delicate, subglobose, spiral, sinistral, small, translucent, with slight yellowish colouring when tenanted; operculum spiral, very delicate, glassy, transparent. Animal twisted like the shell and wholly retractile, with a dorsal pallial cavity, and a ventral columellar muscle; a long extensile appendage on the right side of the mantle margin and somewhat ventrally; posterior lobe of foot, which bears the operculum, is hollowed out on the middle of its free margin; fins toward their distal extremity beset with muscular fibres.

Spiratella Blainville 1817. Umbilicate, with left-handed spiral turns gradually increasing; smooth or striated; mouth rather large; columella not prolonged into a rostrum; operculum semilunar, with a right-handed spiral of few whorls. Type—*Clio helicina* Phipps. Animal with an indistinctly defined head, which is only marked externally by the lips on the border of the mouth and by the tentacles; fins elongated, enlarged, truncated.

S. inflata d'Orbigny 1836 (*Atlanta*) (= *Spirialis rostralis* Eldoux & Souleyet 1840). Pl. 1, fig. 20. Subdiscoidal, very thin, transparent, smooth, umbilicate; spire sinistral, depressed, not raised above the last whorl; whorls three, convex; mouth heart-shaped; peristome acute, produced anteriorly to a long slightly curved beak; operculum ovate, glassy, paucispiral. Greatest diam. 1.5 mm. Dredged—Neptune Islands, Cape Borda, 62-104 fathoms. Also Western Australia—80 miles west of Eucla, 80 fathoms. Distribution—All warm seas. (Atlantic, 42°N. to 40°S).

S. bulimoides d'Orbigny 1836 (*Atlanta*). Oblong, very thin, transparent, smooth; spire elongated, sinistral, apex subacute; whorls six, convex; mouth ovate, angulated anteriorly; columella somewhat arcuate; outer lip thin, sharp; inner lip and sutures often pinkish; operculum ovate, glassy, paucispiral. Height 2, diam. 1 mm. Recorded from South Australia (Verco M.S.) In all warm seas, but not so common as *S. inflata* d'Orbigny.

TETHYIDAE (= *Aplysiidae*).

"Sea Hares." Shell thin, horny, nearly or entirely covered by the mantle shield-shaped, in the form of a concave plate, sometimes absent. Distribution—almost world wide, tropical and temperate, in shallow coastal water. Fossil—Tertiary (doubtful). Animal slug-like, not protected by a shell, semioval when at rest, but capable of considerable extension, of a fleshy substance, neck and head narrower than

the body; mouth a vertical fissure with large and strong jaws; anterior angles of head produced in two tentacular lobes folded above; hinder or true pair of tentacles semitubular, not unlike the ears of a hare; eyes small, sessile, in front of the hinder or true tentacles; foot large, attached to the body throughout its whole length; it expands on each side, so as to form two lobes, which interfold over the back and are used for swimming; gills in a cavity towards the posterior part of the back, and protected by the mantle; stomach armed with cartilaginous nodules; vent placed behind the gill. Each individual has the sexes combined; the organs of generation are separated and situated at the opposite extremities of the body. Rather large animals of flabby consistency, remarkable for the four large ear-like tentacles and high back which have earned for them the name of sea-hares. At the hinder part of the back two flaps of the mantle partly conceal a thin horny shell which serves as a protection to the gills and vital organs beneath. Their colours in life are often bright and variegated. Being without shelly armour, they appear to be largely dependent upon imitative colouring for protection and so closely resemble shoots of weeds that it is difficult to distinguish them. When molested they discharge a large quantity of violet or purple fluid from the edge of the internal surface of the mantle, which does not injure the skin, although the ancients thought differently; they also expel a milky fluid which is nauseous. They not only crawl, but swim actively by means of the swimming lobes. Sea-hares live chiefly on marine plants also on other Mollusca as well as small Crustacea and Annelids. They are, like rabbits, salacious and prolific. Spawning cases gelatinous, of a pinkish hue, thread-like, and irregularly convoluted; ova white and very numerous, lying in the middle.

Tethys Linne 1758 (= *Aplysia* Linne 1767 and of subsequent authors: = *Laplysia* Linne 1767: = *Siphonotus* A. Adams and Reeve 1848). Tethys, a marine goddess, wife of Oceanus, mother of the river-gods and sea-nymphs; the sea (personified).

"Sea Hare." Shell oblong, very thin, membranous, with a thin calcareous inner layer, nearly as large as the mantle, concave; posterior sinus concave; embryonic shell small, pointed, recurved. Type—*T. leporina* Linne.

T. norfolkensis Sowerby 1869 (*Aplysia*). Pl. 1, fig. 21. Shell horny, brown, arched, ventricose, obliquely subovate, thin, smooth; apex elevated, round, auriculated at the back; upper margin sloped, excavated; outer lip rather convex; lower margin rounded; dorsal margin arched, rounded, thinly reflected near the apex, obliquely inclined towards the lower end. Length 19, diam. 16 mm. MacDonnell Bay under stones at low-tide during January spawning (Cotton). Type locality—Sydney Harbour.

This species has not been found, as the name falsely implies, at Norfolk Island (Hedley). The auricle produced by the reflected dorsal margin is more expanded in *T. concava* (*Aplysia*) than in this similarly shaped but differently coloured shell (Sowerby). Animal about 40 mm. long, brown as the kelp-weed, spotted with scattered white dots, and edged with black along the margins of the lobes and on the tentacles; parapodial lobes short, united behind, with digitate margin, free from the siphon; crown of shell protruded through an opening in the centre of the mantle; on hind right side the mantle is produced into a large orifice enclosed by upstanding lobes; from the shell the mantle is rayed with brown and white; branchiae in life entirely concealed; tail rather long. The animal kept in confinement did not use its lobes for swimming, and emitted purple when annoyed. The exposure of the shell and production of mantle in a tube connects this with the European *T. depilans* Linne, and consequently places it in the typical section of *Tethys* as restricted by Pilsbry. Probably *A. brunnea* Hutton, *A. tryoni* Meinertz, and others will be reduced to the synonym of *T. norfolkensis* when they are carefully re-examined (Hedley).

UMBRAKULIDAE (= *Umbrellidae*).

Shell external, limpet-like; vertex near the centre; nucleus minute, sinistral; interior with a circular closed muscle-impression. Distribution—World-wide, tropical and subtropical, laminarian zone and deeper. Fossil—Eocene. Animal having the foot very fleshy, large, oval, with a deep anterior sinus in which the mouth-parts are situated; gill a long adnate plume, extending across the front and along the right side, free and bipinnate behind. Both sexes are combined in the one individual. Plant feeders.

Umbraculum Schumacher 1817 (= *Umbrella* Lamarck 1819; = *Umbella* d'Orbigny 1841; = *Operculatum* H. & G. Adams 1854. *Umbraculum*, a parasol. "Chinese Umbrella-shell." Limpet-like, depressed, sinistral; vertex to the left of and somewhat behind the centre, usually coloured, more or less conically elevated; apex of scarcely more than one whorl, minute, curved backward. Type—*Patella umbraculum* Solander 1786 = *Patella umbella* Martyn 1788, which occurs from East Africa to the Sandwich Islands.

U. corticalis Tate 1887. Pl. I, fig. 22. Orbicular, moderately elevated, thin; primrose yellow; concentrically striated, and with a few obscure radial ridges; covered, except apex, with a well developed periostracum, which extends about half as far again as the shell, and raised into about twenty broad rays, diverging from apex, and is concentrically lamellose; ferruginous white,

but encircled with a band of maroon, corresponding with the edge of the shell; periostracum very tough, and can be readily removed in one piece; apex prominent, somewhat incurved, a little excentric. Height 4, transverse diameters 19 and 15 mm. Specimen illustrated. Height 5, diameters 30 and 26 mm. Rather rare—Henley Beach, Corney Point, Coobowie, St. Francis Island, also dredged Cape Jaffa, 90 fathoms. Type locality—Lower end of the South Channel of Port Phillip, 7-16 fathoms, sand and weed [J. B. Wilson]. Animal deep port-wine colour, foot circular with an extended margin, underside of mantle covered with small white carunculae (small pieces of flesh).

SCYLLAEIDAE.

Animal compressed; mantle produced into lateral lobes, which bear the branchial processes; tentacles with sheaths; mouth armed with corneous jaws. Distribution—South Britain, Mediterranean, Philippines, Australia, on floating seaweed.

Scyllaea Linne 1758. *Scyllaea* = a sea nymph. Animal elongated, compressed; foot long, narrow, and channelled, adapted for clasping seaweed; back with two pairs of wing-like lateral lobes, bearing small tufted branchiae on their inner surfaces; tentacles dorsal, slender, with lamellated tips, retractile into long sheaths; gizzard armed with horny knife plates; orifices on the right side. Type—*S. pelagica* Linne 1758.

S. pelagica. Linne 1758. Pl. 2, figs. 10, 11. "The Pelagic Scyllaea." Body higher than broad, cream-coloured, transparent; tentacles rather small, laminated, issuing from large, compressed, trumpet shaped sheaths, frilled posteriorly; branchial processes consisting of two lobes on each side of the back (which are large, flattened, and rather irregularly shaped, each bearing tufts of branchial filaments over their inner surface) and of a central posterior, crest shaped lobe (also bearing filaments) towards the tail; foot linear, the sides thin and capable of being drawn together for clasping. South Australian large specimen, length 42 mm, length of lobes 16 mm. Height of body 21 mm., making a total height of 37 mm. Antechamber Bay (Kangaroo Island), 20 fathoms; Port Willunga beach, also Terre d'Edels, W.A. (Peron). A world-wide pelagic species, on floating seaweed. It is singular among Sea-slugs in having its stomach fitted with plates of chitin to break down its food. Somewhat variable. The main differences are in the length of the dorsal lobes and the coloration, the former feature depending largely upon the degree of contraction, and the latter, no doubt, upon the colour of the seaweed up on which the animal lived.

AEOLIDIDAE ($= Eolididae$.)

Animal elongated, slug-like; rhinophores non-retractile; dorsal papillae spindle-shaped or club-shaped, each ending in an open sac of endodermic origin which communicates with the hepatic caecum and contains nematocysts; anus lateral; mouth armed with horny jaws. Distribution—All seas.

Eolidina. Quatresages 1843 ($= Acolidiella$ Bergh 1874).

Animal ovate or linear; head with very long cylindrical buccal tentacles; rhinophores simple; dorsal papillae compressed; anterior angles of foot prominent; orifices of generative system and vent on right side; salivary glands very large. Type—*A. sommeringii* Leuckart.

E. faustina. Bergh 1900. Papillae covering nearly the whole of the dorsal surface; anteriorly their arrangement produces two horseshoe shaped figures; behind these four there are about ten somewhat oblique rows, each row with about six to eight papillae: they are cylindro-conic and close together; anal papillae behind the sixth row; colour dirty light-yellowish. Length 15, breadth 3.5 mm. Tasmania. Not recorded from South Australia so far, but the description is given here so that this, or allied species of the family may be recognised in the event of their being found.

PLEUROPHYLLIDIADAE.

Animal oblong, depressed, fleshy; mantle, somewhat coriaceous, covering upper part of body and notched in front; head short, broad, forming a triangular lobe in front of the mantle, mostly with plaited lips and strong horny jaws; tentacles two very small, conical or club shaped, close together, retractile, each in a socket within the pallial notch; foot elongated, somewhat narrower than the mantle, slightly indented in front and abruptly pointed behind; gills placed under the edges of the mantle on the hinder two-thirds of the body, and arranged in an oblique row of very numerous leaflets or laminae on each side; vent lateral, posterior; generative organs on same side, but near the front. Distribution—All seas.

Pleurophyllidia Meckel ($= Diphylidia$ Cuvier: $= Linguella$ Blainville: $= Armina$ Rafinesque). The genus name refers to the leaf-like gills on the sides. Animal oblong, fleshy; body depressed, mantle large, expanded, smooth, simple above; gills limited to the hinder two-thirds of the body; head partially concealed by the mantle with minute tentacles and a lobe-like veil formed by the expanded tentacles. Type—*P. lineata* Otto.

P. cygnea. Bergh 1876. Pl. 1, fig. 19, Pl. 4, figs. 1-10, and Pl. 2, figs. 8, 9. "The Swan River Pleurophyllidia." Animal elongate, oblong; sides nearly parallel, terminating in a blunt point

posteriorly; dorsal surface flat sloping towards the posterior extremity; mantle (nothaeum) fairly ample, slightly waved along the edge, and extending from behind the rhinophores; ornamented longitudinally, with a series of roughly parallel, black and yellowish, undulating ridges, the medial of which extending throughout the whole length, the lateral passing out at the sides, bordered with yellow; the lobe-like veil is colourless, edged with yellow, and with a few yellow-spots in its centre; foot dilated laterally in front, tapering behind; the edge waved and extending to beyond the sides of body; it is flat, grooved longitudinally along the centre posteriorly, and does not project appreciably behind the mantle; rhinophores longitudinally laminate, pink, contractile; branchiae pink, on the under side of the lateral projection of the mantle; mouth prominent; genital orifice and anus prominent on the right side, the latter 19 mm. behind the former; entire under surface a uniform light crimson. Length 82, breadth 34 mm. Antechamber Bay (Kangaroo Island), 20 fathoms; Gulf St. Vincent. Also Swan River W.A. Rare, and appears not to inhabit the beach zone. (Type locality—Swan River, Western Australia). Basedow and Hedley state that their specimen was kept alive for several days in a glass of sea-water, and it was still alive when transferred to the preservative; it has retained its colour remarkably well in a weak solution (3 per cent.) of formalin.

ARGIDAE (= Dorididae).

Animal of variable form, generally depressed; mantle oval, covering the head and greater part of body; buccal tentacles ill developed; branchiae generally retractile, on the posterior or medio-posterior part of the back, usually forming a circle round the anus; skin strengthened with spicules, more or less definitely arranged. Distribution—All seas.

Archidoris. Bergh 1878. Animal elliptical, of soft consistency, plump, slightly depressed; back more or less granular or tuberculate, the opening for the rhinophores simple; tentacles short, thick folds at the sides of the small head, with an external furrow; the retractile gill composed of a few tri- or quadri-pinnate leaves; foot broad, with a furrow at the anterior margin; the labial disc merely clothed by a simple cuticle. Type—*Roris tuberculata* Alder & Hancock. (= *Archidoris britannica* Johnston 1838 [Europe]). The genus is probably cosmopolitan, but most abundant in temperate seas.

A. varia. Abraham 1877 (*Doris*) (= *Doris variabilis* Angas 1864, preoccupied by Kelaart 1859; = *D. praetenera* Abraham 1877). Pl. 2, fig. 6, 7, and pl. 4, figs. 11-13. Animal elliptical, depressed, with varied coloration; a beautiful shade of orange, in

part dappled with brown, and almost a pale yellowish-grey; branchiae large, branching, spread, slaty grey; dorsal tentacles somewhat club-like, slaty-grey; labial tentacles rather prominent. Length 44, breadth 12.5 mm. At low water, Port Noarlunga; dredged Gulf St. Vincent, Spencer Gulf, Port River, 4-20 fathoms. (Type locality—Port Jackson). With South Australian examples it is noted that the skin is soft, and, in preserved specimens, has a flabby appearance. In dead examples the rugosities of the back sometimes appear. The rhinophora arise from elevated conical sheaths, and are ornamented with about 24 lamellae. Oral tentacles, with a deep longitudinal groove on the exterior side. Branchial plumes five, tripinnate. Colour ranges from pale yellowish (Gulf St. Vincent) to dark reddish-brown (Port Adelaide River). The wrinkles on the back are outlined and exaggerated by a mesh-work of dark lines. The sole of the foot is white, edged with rich orange, and through the thin skin the liver is visible. Along the edge of the mantle muscle-fibres are discernible as short, white, radiating lines. This species is as abundant in South Australian waters as in Sydney Harbour.

A. staminea Basedow & Hedley 1905. Pl. 2, figs. 4, 5.

Staminea = full of threads. (From the dark vein-like threads with which the animal is marked.) Animal irregularly elliptical, very slightly narrower posteriorly, convex; cloak ample, frilled along the border; uniform yellow tint; roughened by very numerous small tubercular elevations and depressions, which cover the skin as separate, stellate, or radiate groups of notches; the underside of the mantle, of a similar yellow colour, marked with vein-like threadlets, multiply dividing and branching towards the outer edge; foot rounded anteriorly, sides almost parallel, terminating in a blunt point, slightly channelled, colour yellow, darkened in the centre by the appearance of the liver through the skin; dorsal tentacles clavate, situated rather far anteriorly; oral tentacles linear, prominent; eyes visible in small examples as little black specks behind the rhinophores. Length 32, breadth 19 mm. (Type locality—20 fathoms, Backstairs Passage, South Australia).

Staurodoris: Bergh 1878. Animal rather depressed, tubercular above; rhinophora also branchiae retractile within rounded pockets; labial disc simple, without armature. Type—*Doris verrucosa* Cuvier.

S. pustulata. Abraham 1877 (*Doris*). Pl. 2, fig. 3. Animal elliptical, moderately convex; mantle ample with a slight waved margin; greenish-grey ground colour, covered with numerous opaque, yellow, warty tubercles of various sizes, standing out prominently from the darker background like golden beads;

foot tapers posteriorly to a blunt point, well within the mantle margin, colour of entire under surface, light flesh-red; rhinophores completely retractile within cavities, the openings to which are surrounded with a circlet of nodulations; branchial plumes seven, tripinnate, of a deeper shade of grey. Length 20, breadth 11 mm. Gulf St. Vincent, also dredged in 20 fathoms. Back-stairs Passage. Type locality—Australia.

Alloiodoris. Bergh 1904. Animal depressed, the back entirely covered with small tubercles; tentacles digitiform. Type—*A. marmorata* Bergh 1904. The hermaphrodite gland does not form a layer over the liver as usual in the family, but is a separate mass.

A. marmorata. Bergh 1904. Pl. 2, fig. 1 and 2. Animal elliptic, symmetrically rounded at both ends, moderately convex; yellowish-white to greyish-brown, covered with minute spiculose elevations on the dorsal surface, which impart to it the brownish tint; also, with less numerous, larger elevations, surrounded by irregular circles of deep brown—the latter occasionally have a centre of opaque white, surrounded by a ring of reddish-brown; the whole giving the impression of miniature craters; ventral surface translucent, white, irregularly sprinkled over with asymmetrical brown spots, either isolated or arranged in small groups; mantle broader than the foot, with a slightly undulating margin, fairly thin along the border, so that the colour markings of the dorsal surface are visible from the under side; foot white, with few scattered spots of brown; rhinophores and branchiae brown, the latter seven or eight in number. Length 22.5, breadth 10 mm. Dredged—Port River, 4 fathoms (Field Naturalists Dec. 1901); at low water on rocks, covered with seaweed, Edithburgh.

Halgerda. Bergh 1880. Animal subdepressed, subridged, smooth above; branchial aperture ovate; branchiae sparsely tri-pinnate; tentacles none; foot narrow; no labial armature. Type—*H. formosa* Bergh.

H. graphica. Basedow & Hedley 1905 (*Albania*). Pl. 4, figs. 17-18, and Pl. 2, figs. 12, 13, "The Hieroglyphic Halgerda." Animal squat, elliptic, rounded at both ends, strongly convex; opaque white, liver faintly visible through the mantle; surface of mantle divided somewhat regularly into quadrilateral figures, on either side of a distinct central line, by slightly elevated ridges on rich orange-yellow; within these divisions are similar elevated curves and lines, in places semi-symmetrical with regard to a dark central spot, almost invariably present in the centre of each division, but easily detachable by slight abrasion; under side of

mantle white, sparsely dotted with large and small black spots, irregularly spaced; foot rounded in front, sides approximately parallel and slightly frilled, ending posteriorly in an obtuse point, much narrower than mantle, opaque white, fringed with a deep orange-yellow border; dorsal tentacles comparatively small, truncated, retractile within low sheaths, brown at the summit, white at the base; oral tentacles fairly long, linear rounded in front; genital aperture inconspicuous, at about the anterior third; branchial plumes six, small, black, finely laciniate. Length 45, breadth 30 mm. (Type locality—20 fathoms, Antechamber Bay, Kangaroo Island, S. Aust.) The remarkable and artificial appearance presented by the ornamentation of this species resembles the hieroglyphic markings of primitive man, and suggests the species-name.

Hypselodoris. Stimpson 1856. Animal oblong, quadrilateral: cloak broad, widely projecting so as to conceal the oral tentacles anteriorly, and tapering from opposite the branchiae, to a blunt point behind, disclosing the foot, which extends further to a distance of one-fourth the length of the body. Dorsal tentaculae elongated, retractile, smooth and glossy to appearance, but having from twelve to fourteen laminae. Branchiae retractile, consisting of twelve elongated, simply-pinnate leaflets, which form a cup around the anus. Colour a dark greenish, or yellowish grey, with numerous black and yellow dots; a row of black spots is conspicuous, margining both the mantle and the foot. Head and oral tentacles bluish-grey. Dorsal tentacles with red tips. Length $1\frac{1}{4}$ inches; breadth 0.3 inch. Found among soft sponges in the circumlittoral zone. Hab. Australia, at Port Jackson. Type—*Goniodoris ? obscura* Stimpson. The above is Stimpson's description of the type species. Stimpson further remarks: "This species, with another closely allied and occurring in the same locality form a genus probably new. It differs from *Goniodorus* (should be *Goniodoris*) in having the retractile tentacula, and in the greater development of the mantle; and from *Doris* by the elevated, oblong, quadrangular shape of the body. I would propose for it the name of *Hypselodoris*."

H. epicuria. Basedow & Hedley 1905. Pl. 2, fig. 14 and Pl. 4, fig. 21. Animal elliptic, oblong, fairly convex, highest in region anterior to branchiae; mantle spiculose, of a rich red colour, and covered with numerous silvery-white spiculose elevations, of lighter shade, with a single row of dark red dots; foot laterally expanded and slit in front, with a median groove, tapering behind, border waved, white, with a single row of largish yellow dots along the upper edge, and the upper surface of the tail with a faint tint of violet or rose; rhinophoral and anal cavities both

encircled with a stellate coronation of opaque white; rhinophores surmounted on a white stalk, with seventeen or eighteen laminae and non-retractile; branchial plumes five, non-retractile, mono-pinnate, with indication of bipinnation at summit, white; oral tentacles linear, projecting considerably beyond the mantle border when in motion. Length 34, breadth 8 mm. (Type locality—Port Willunga Beach, S. Aust., thrown up during a gale).

Aethodoris Abraham 1877 (= *Albania* Collingwood 1881). Animal with frontal limb bilobed, each lobe arched bearing twelve to fourteen dentations. Type—*J. indica* Alder & Hancock. Abraham introduces the genus in the following words:—"Alder & Hancock figure in vol. 5 of the Zool. Soc. Transactions, a form belonging to a new genus, apparently related to *Goniodoris*. As no specimen came into their hands they could give no description. The most striking characteristic seen in the drawing, is with the apex curving backwards, and the margin bearing twelve to fourteen conical dentations."

A. verconis. Basedow & Hedley 1905 (*Albania*). Pl. 3, figs. 6, 7, Pl. 4, figs. 19-20. Animal oblong-ovate, rounded in front, moderately flattened on top, sides elevated, tail strong acute with a distinct central dorsal ridge, extending beyond the mantle edge when in motion; tinted dorsally, with faint, semi-transparent, reddish-violet near the border, fading imperceptibly to light brown in central region, which is further traversed by a fine network of opaque white lines; ventrally uniform pale violet; mantle serrated along the sides, produced frontally; head large, distinct; foot acutely pointed, with a border frill; rhinophores small, clavate, laminate, with about 12 laminae, non-retractile; genitalia large, at about the anterior fifth; branchial plumes ten, simply pinnate, completely surrounding the vent, non-retractile, opaque white. Length 27, breadth 11, height 9 mm. (Type locality—20 fathoms, Antechamber Bay, Kangaroo Island, S. Aust.) Basedow & Hedley remark: "With considerable hesitation we have referred this species to *Albania* (a synonym of *Aethodoris*). The general appearance, branchiae, and serrate edge of mantle suggest this genus. Collingwood describes a frontal veil in the type species; this was not observed in the living animal (from Antechamber Bay)."

Ceratosoma Adams & Reeve 1848. Animal elongate, prismatic, smooth, ending in a bluntly pointed tail; the dorsal surface passes into a post-branchial flesh protuberance; mantle obsolete; tentacles club-shaped, non-retractile, without sheaths; rhinophores laminated; branchiae with the roots more or less coherent, placed in front of and partially around the tubular anus, with which they

PLATE II.

- Fig. 1.—*Alloiodoris marmorata* Bergh. Dorsal view.
Fig. 2.—*Alloiodoris marmorata* Bergh. Ventral view.
Fig. 3.—*Staurodoris pustulata* Abraham. Dorsal view.
Fig. 4.—*Archidoris staminea* Basedow & Hedley. Dorsal view.
Fig. 5.—*Archidoris staminea* Basedow & Hedley. Ventral view.
Fig. 6.—*Archidoris varia* Abraham. Dorsal view.
Fig. 7.—*Archidoris varia* Abraham. Ventral view.
Fig. 8.—*Pleurophyllidia cygnea* Bergh. Dorsal view.
Fig. 9.—*Pleurophyllidia cygnea* Bergh. Ventral view.
Fig. 10.—*Scyllaea pelagica* Linne. Lobes contracted.
Fig. 11.—*Scyllaea pelagica* Linne. Lobes expanded.
Fig. 12.—*Halgerda graphica* Basedow & Hedley. Dorsal view.
Fig. 13.—*Halgerda graphica* Basedow & Hedley. Ventral view.
Fig. 14.—*Hypselodoris epicuria* Basedow & Hedley. Dorsal view.

PLATE II.

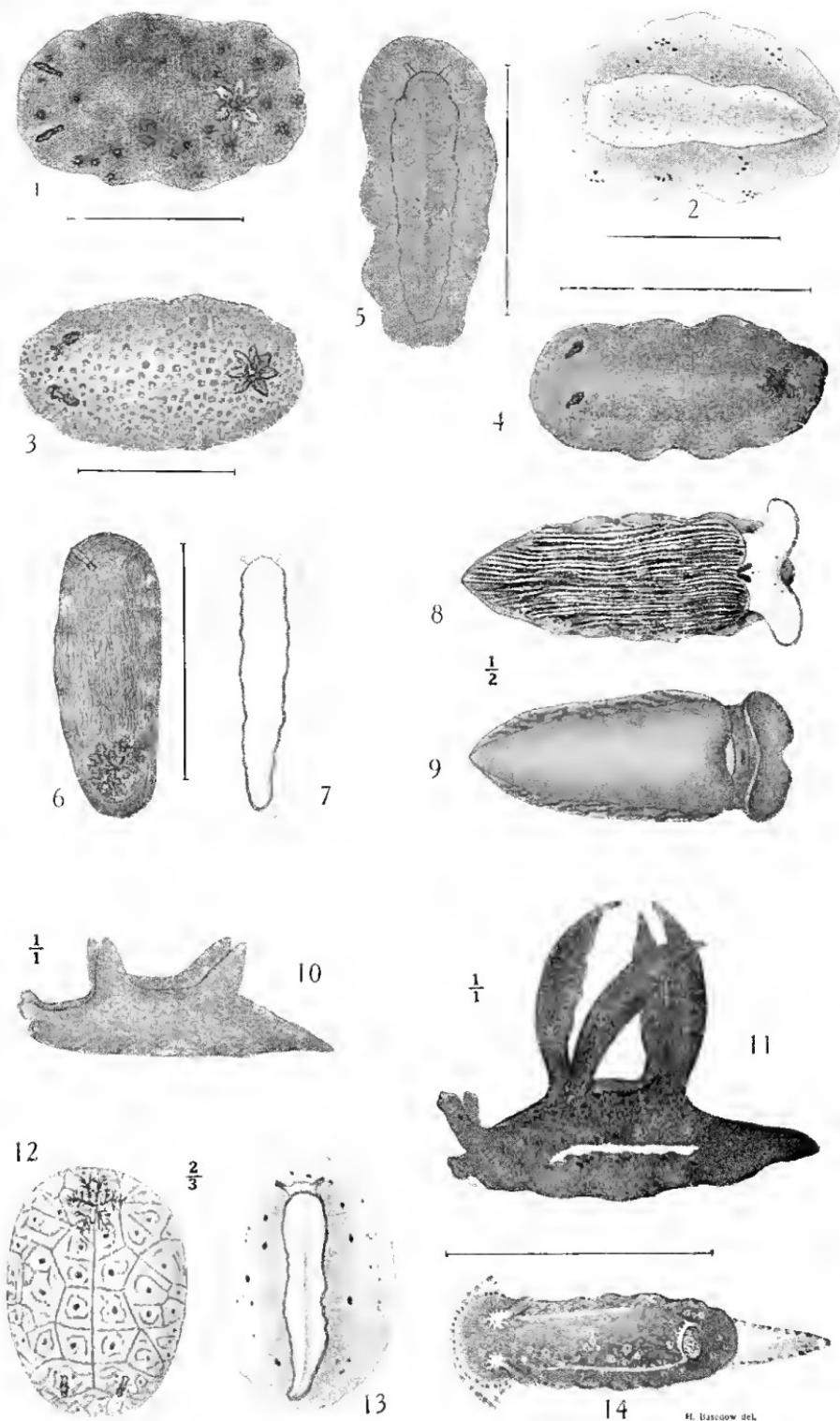


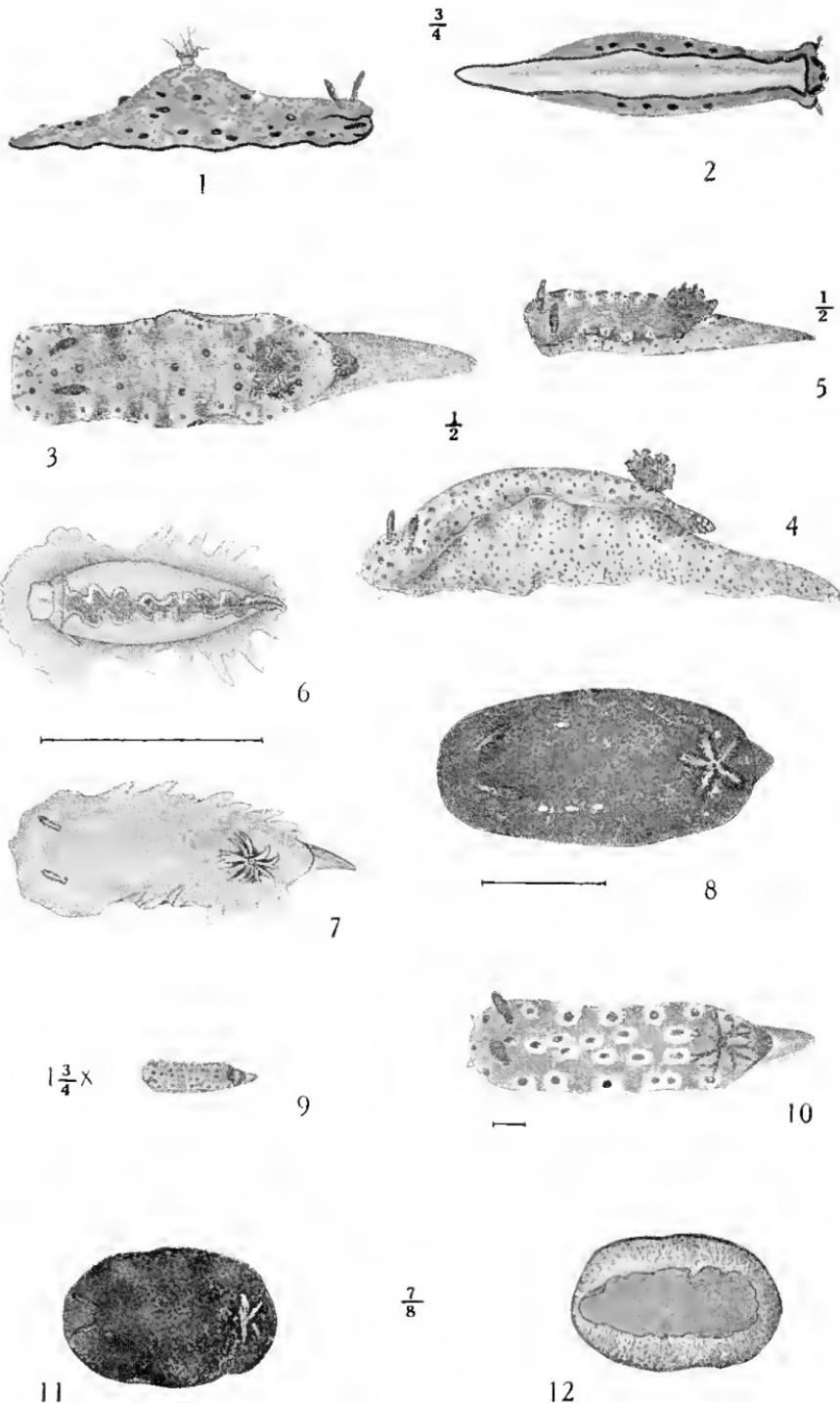




PLATE III.

- Fig. 1.—*Nembrotha verconis* Basedow & Hedley. Lateral view.
Fig. 2.—*Nembrotha verconis* Basedow & Hedley. Ventral view.
Fig. 3.—*Ceratosoma brevicaudatum* Abraham. Dorsal view, deep water form.
Fig. 4.—*Ceratosoma brevicaudatum* Abraham. Lateral view, deep water form.
Fig. 5.—*Ceratosoma brevicaudatum* Abraham. Lateral view, shallow-water form.
Fig. 6.—*Aethodoris verconis* Basedow & Hedley. Ventral view.
Fig. 7.—*Aethodoris verconis* Basedow & Hedley. Dorsal view.
Fig. 8.—*Doriopsis aurea* Quoy & Gaimard. Dorsal view.
Fig. 9.—*Ceratosoma adelaidae* Basedow & Hedley. Dorsal view.
Fig. 10.—*Ceratosoma adelaidae* Basedow & Hedley. Dorsal view (greater enlargement).
Fig. 11.—*Doriopsis carneola* Angas. Dorsal view.
Fig. 12.—*Doriopsis carneola* Angas. Ventral view.

PLATE III.





are retractile into a common, smoothly margined cavity. Type—*C. cornigerum* Adams & Reeve. Adams adds: "In *Ceratosoma* the tentacles are bulbous at their bases, the body is smooth, and the foot is linear and grooved The proboscisiform mouth is frequently exserted in these animals just before death The animals, which somewhat resemble *Polyceræ* are inhabitants of tropical seas, where they are found crawling on the corallines and madreporites." Abraham adds, Ann. Mag. Nat. Hist. 1876: "Mouth subterminal, with a small deep pit at each side; pedal surface long and linear, extending to end of tail, without free border, but with the edges contractile across the median groove; radula broad, with numerous rows of simple spines, none of which are central; a spinous buccal collar." Adams & Reeve described the dorsal tentacles as non-retractile, but corrected in Alder & Hancock's Synopsis. They are certainly retractile in the four species represented in the British Museum collection.

C. brevicaudatum. Abraham 1876 (= *C. oblongum* Abraham 1892). Pl. 3, figs. 3, 4, 5, and Pl. 4, fig. 14. Animal large, elongate, dorsally flat, rounded in front, sides nearly parallel except along a slight lateral enlargement in the centre, and tapering to an obtuse point behind; sides much elevated, especially in the region of the vent; cloak obsolete, subquadrangular, with an undulate margin, and ending posteriorly in a peculiar nipple-like protuberance; shaded with tints of buff to light brown, deeper colour at border and fading inwards, leaving along the margin of the dorsal surface a series of alternate light and dark patches, there being in the centre of the former in each case a round, violet-purple spot surrounded by a uniform ring of reddish-purple: the central area of this surface is richly sprinkled with circular spots of varying size, of a light violet-purple colour, with a darker border, and sometimes surrounded by a rim of light lemon: the post-branchial flesh protuberance "is decorated by a series of brown circles, placed contiguously so as to produce a regular network with meshes of different dimensions; the sides are somewhat similarly marked to the cloak, being lightly tinted and richly sprinkled with three irregular, longitudinal rows of spots, the two outer rows of rich purple, the inner of a lighter violet-purple; the median row does not extend to beyond the length of the cloak, and thus leaves the dorsal portion of the tail marked with deep purple spots only; foot linear, tapering posteriorly to a blunt point, white dorsal tentacles clavate, obliquely laminated, the number of laminae varying from sixteen to thirty or more, rich orange; sheaths slightly elevated; oral tentacles stout, subconical, tapering; genital aperture prominent, branchial plumes twelve; intergrown at the base, incompletely

surrounding the tubular anus in horseshoe shape, the posterior portion being bare, they are retractile with the anus into a common cavity, colour rich reddish-yellow. Length 111, breadth 25, height 31 mm. At low water, Port Noarlunga, and Salt Creek Bay (Yorke Peninsula). Dredged Gulf St. Vincent, and Antechamber Bay (Kangaroo Island), 20 fathoms. Also Western Australia. Appears fairly plentiful in Gulf St. Vincent. Though specifically identical, the littoral specimens are nowhere nearly as large as the deep water forms. (Type locality—Australia). The difference between *C. brevicaudatum* and *C. oblongum* appears to be merely a matter of preservation, as from the same dredging some individuals shrunk to the shape of *oblongum* and others assumed in contraction the form of *brevicaudatum*.

C. adelaidea. Basedow & Hedley 1905. Pl. 3, figs. 9, 10. Animal small, flattened on top, elongate, a little wider at the head, terminating in a small tail; mantle sparingly developed; foot rounded in front, attenuated behind, projecting to no considerable extent beyond the mantle; white underneath, scantily spotted with light lilac along the sides; dorsal surface mostly pale buff, bordered on either side by about eight somewhat regularly spaced deep reddish-violet spots, which are surrounded each by a whitish space, the interspaces between these spots being of a somewhat deeper shade of brown than the rest; dorsal tentacles club shaped, orange-red, obliquely laminated; branchial plumes coherent at their base, about six, non-retractile, of the same tint as the rhinophores. Length 8, breadth 3 mm. At low water, Alarino Rocks, South Australia (type locality) also Edithburgh. Appears to live on the under side of rocks covered by seaweed, and partially buried in soft mud.

DORIOPSIDAE (= Doridopsidae).

The members of this family simulate the true *Dorididae*, but may be recognised by the poriform mouth and the very small adherent oral tentacles. The form is mostly plump, not elongated, the dorsal surface smooth or tuberculate. Mantle edge rather broad, wavy, covering the head and sometimes the tail. Pockets of the rhinophores mostly with a smooth margin, the rhinophores completely retractile, usually with twenty-five or thirty-five lamellae. Branchiae arranged in a circle round the anus, situated on the dorsal surface above the mantle border, their number varying from four to eight tri- or quadri-pinnate. Jaw and radula are wanting, the pharynx being suctorial. Genital pore on the right anterior side. Distribution—Mosily tropical and subtropical. The absence of a radula justified family rank.

Doriopsis. Pease 1860 (= *Doridopsis* Alder & Hancock

1864: = *Haustellodoris* Pease 1871: = *Rhacodoris* Mørch 1863: = *Hexabranchus* Gray, not of Ehrenberg: = *Dendrodoris* Ehrenberg). External characters very similar to *Doris*, but of softer consistency and with an undulating mantle edge; mouth, a fine pore; buccal gland at posterior end of pharyngeal bulb in front of the salivary glands. Type—*Doris limbata* Cuvier. The spawn is ribbon shaped.

D. aurea. Quoy & Gaimard 1832 (*Doris*). Pl. 3, fig. 8. Animal oval, convex, smooth; golden-yellow spotted with white; tentacles laminated. Length 15, breadth 6 mm. Orontes Shoal (Yorke Peninsula), $5\frac{1}{2}$ fathoms; American River (Kangaroo Island) 9 fathoms, on weed. (Type locality—Jervis Bay, New South Wales, deep water). Quoy & Gaimard add: "This species is oval, the back raised, rounded, smooth; colour a beautiful velvety orange, with some white dots on the upper parts; tentacles fairly long, olive coloured, transversely lamellated; branchiae have five divisions, very finely branched out of the same colour as the body; mouth only just apparent. The ramifications of the veins are well seen beneath the mantle, which is not usually the case with the *Doris* group." Basedow and Hedley remark: "The French authors describe their species as over two inches in length, ours is only 15 mm long and 6 mm. broad. The white dots on the back are more regularly disposed in Quoy & Gaimard's figure, and the foot in South Australian specimens is white, whereas, in the figure quoted, it is red."

D. carneola Angas 1864 (*Doris*). Pl. 3, figs. 11, 12. Animal oval, golden-brown, lightly dotted with white (not conspicuously besprinkled); branchiae large, branching, white. Length 29, breadth 17.5 mm. Marino, from under rocks, at low water. (Type locality—Port Jackson). The colouration of one South Australian example was identified with that of the Port Jackson type, while another individual from Marino had quite a different colour scheme. It was a dirty greyish-white on the back, speckled with silvery-white dots, which are connected by a faint net-work of white lines, the central space in the region of the liver appearing pinkish or brown; ventral surface white. The underside of the mantle of both individuals is marked with delicate vein-like multiple branching lines. The mantle is ample, hard, thick, and fortified with numerous calc-spicules. The foot is large, and terminates bluntly. The rhinophores are clavate, with about ten laminae; situated rather far anteriorly; colour yellow or white. We do not note the projecting sheaths of these tentacles, that are apparently represented in Angas's sketch. Branchial plumes four, tripinnate, light orange or white (Basedow & Hedley).

POLYCYERIDAE.

Animal with mantle small or obsolete, generally with marginal appendages, integument usually spiculose; rhinophores various, often laminated. Alder & Hancock divide the *Polyceridae* into two sections according as the rhinophores are retractile or non-retractile. Distribution—All seas.

Nembrotha. Bergh 1877. Small, slug-like, smooth, rather raised in central region; without definite dorsal margin between back and sides; body without dorsal and frontal appendages; foot narrow, elongated into a narrow tail behind, bluntly rounded at front end; rhinophores retractile; branchiae non-retractile, three to five, strong, stout, situated about the centre of the dorsal surface and almost surrounding the anus; oral tentacles small; radula narrow; jaws usually absent; hermaphrodite gland spread over liver. Recorded chiefly from Indo-Pacific region, between tides under stones. Type, designated by O'Donoghue—*Nembrotha nigerrima* Bergh. Possibly *Nembrotha* may be only a synonym of *Angasiella* Angas & Crosse 1864.

N. Verconis. Basedow & Hedley 1905. Pl. 3, figs. 1, 2, and Pl. 4, fig. 16 "Verco's *Nembrotha*." Animal large, linear, oblong, swollen in centre, tapering behind; lemon-yellow, with large disconnected blunt tubercles of deep prussian blue somewhat parallel to the edge of the foot; skin delicate, peeling off easily on abrasion, wrinkled; cloak almost entirely wanting; frontal margin (veil) small, deep prussian blue, of three semi-circular dilations, the two lateral of which arch laterally around the dorsal tentacles on either side, then gradually fading to nil posterior to them; foot is square in front, dilated outwardly at anterior end, sides slightly frilled, approximately parallel, passing posteriorly to a bluntnish point, colour light sea-blue, with a deep blue border; liver visible as a faint brown patch in the centre; dorsal tentacles sub-clavate, tapering, laminated, about thirty slightly opaque laminae, non-retractile, deep prussian blue, with a yellow stalk; eyes not visible; genital aperture prominent, at about the anterior fourth, lighter (greenish) blue than the tubercles; branchial plumes five, tripinnate, almost completely surrounding the anus, dark yellow at base, passing into rich blue along the stems and delicately fringed with small purple tufts. Length 55, breadth 12mm. Dredged—20 fathoms, off Newland Head, Backstairs Passage. The indications of the existence of a cloak are almost entirely wanting, beyond the slight continuation of the frontal margin past the dorsal tentacles and the somewhat linear arrangement of the tubercles. This species is clearly separated from co-generic forms by its vivid primrose colour.

THE FLORA BETWEEN OUTER HARBOUR AND SELLICK'S BEACH, SOUTH AUSTRALIA

(By J. B. Cleland, M.D.)

PART III*

(4) The Reedbeds At Fulham

The Reedbeds were formed by the waters of the Torrens, obstructed by the coastal sandhills, spreading out laterally over alluvial flats and junctioning by more definite channels with the Port River on the north and the Patawalonga on the south. Thirty or more years ago they were what their name implies, extensive swamps covered with water two to several feet deep, through which grew an abundance of the Common Reed (*Phragmites communis*) and of the Bulrush (*Typha angustifolia*). As a result of the destruction of the natural vegetation of our hills, the creeks flowing into the Torrens have been bringing down annually vast quantities of soil in their flood waters. The loss of cover in the valleys and on the hillsides has made these water-courses tearing torrents after heavy rain, in contrast to the comparatively gentle passage of the water in the years before the white man's interference when the fall from even heavy showers was partially held up for a time amongst the spongy vegetation. The finer particles of silt have been carried through Adelaide to be deposited over the swamps at the Reedbeds and the surface of these has been raised in consequence till much of it is now five or six feet higher than a generation ago. Each individual flood may leave behind only a quarter to several inches of silt but in the course of a few years this soon mounts to feet. This silting combined with drainage channels has reclaimed nearly all the swamp and changed the whole face of the area. Though the flats are still liable to be flooded at times by break-aways from the main channels, hardly any remnants of the original swamps remain and there seems to be no record of the primeval vegetation. Some excavations on the late Mr. Charles White's property made by the late Mr. William White a number of years ago, just to the south of where the Henley Beach tram emerges on the seaward side after crossing over the 'swamps,' are now filled with water and probably indicate what the Reedbeds were like in the early days. Surrounding small areas of open water

*Part I appeared in Vol. XIV., No 1, November 1932, pp. 45-48;
and Part II in No. 2, February 1933, pp. 55 and 56.

was a dense mass of tall and upright Common Reeds and Bulrushes whilst the long leaves of *Triglochin procera* floated on the water. These seem to be almost the only relics left of the native swamp vegetation and even in the reclaimed pasture lands native plants are few in number, the majority of the plants being introduced grasses, clovers, medics and weeds. There are a few clumps of the sedge *Cyperus vaginatus* on the flats, along the channels *Alternanthera denticulata* grows as their waters dry up, an occasional plant of *Rhagodia nutans* with its red fruits may be found on the banks, and the Great Bindweed *Calystegia sepium* with its pale pinkish Convolvulus flowers climbs amongst Box-thorns and other introduced shrubs.

As the narrow channel of the Torrens approaches the sand-hills, most of the waters are now deviated southwards by an irregular course to junction with the waters of the Patawalonga, though some still find a route towards the Port River. The latter direction naturally leads to some silt reaching the navigable portion of this River, so endeavours are made to restrict any flow to the north.

Further back towards Adelaide an overflow has been cut leading away floodwaters from the Torrens, at its entrance into Captain White's property of Weetunga, to the south where these can junction with tidal branches of the Patawalonga and thus obviate flooding. The Torrens at this spot has banks partly artificially raised, which are 15 feet high. The following plants have been noted on the banks of the river and in and along the break-away channel as it passes under the main road and runs along the west side of the Kooyonga Golf Links:—The grasses *Paspalum distichum*, *Polypogon monspeliensis*, *Agrostis alba* (?), *Calamagrostis filiformis*, *Phragmites communis* (the Common Reed, eaten by cattle when young), *Holcus lanatus*, and Rice Grass; *Potamogeton crispus* (Curly Pondweed) in the water in the Breakaway Creek; the sedges *Cyperus rotundus* (Nut-grass, a pest evidently brought down from Adelaide by flood waters) and *Scirpus maritimus*; the Toad Rush (*Juncus bufonius*), and *J. pauciflorus*; the Bulrush; *Polygonum serrulatum*, *Alternanthera denticulata*, Water-cress, a *Ranunculus*, *Euphorbia peplus* (a spurge), *Lythrum Hyssopifolia* (Lesser Loose-strife), the introduced white-flowered *Convolvulus* (*C. arvensis*, a pest washed down from Adelaide by flood-waters), *Datura*, the introduced *Antirrhinum Orontium*, *Verbena bonariensis* and *V. supina*, *Plantago major*, *Aster subulatus*, Bathurst Burr, *Cotula coronopifolia* and the introduced Wild Lettuce.

(5) The Pinery On The East Side Of The Port River Between Alberton And The Grange

The Pinery consists of a sandy slightly raised ridge, a consolidated sand-dune, stretching for several miles close to the east bank of the river. It has a very interesting flora and contains a few plants which are rare. It also shows affinities with the mallee scrub in having *Grevillea ilicifolia*. At one time this was quite a forest of Native Pines (*Callitris propinqua*) with Pepper-mint Gums (*Eucalyptus odorata*) and some Black Tea-tree (*Melaleuca pubescens*), *Eucalyptus leucoxylon* and Sheoaks (*Casuarina stricta*). Much of the timber has been cut out, though a considerable number of Pines still exist and young ones are coming up. The land was bought by the Government for soldier settlements but found unsuitable. As part is leased as golf-links, it is to be hoped that this interesting bit of country will be preserved in future more or less intact. Its interest as a reserve is somewhat offset by the prevalence of mosquitoes. A number of Native Peaches (*Eucarya acuminata*) still grow here though it is doubtful if they form fruit. Most of what appear to be young ones are probably suckers. Other scattered bushes include *Acacia armata*, Golden Wattle (*A. pycnantha*), *A. ligulata* (heavily galled), *Banksia marginata*, *Dodonaea viscosa*, *Myoporum insulare* and the introduced *Nicotiana glauca* and *Opuntia monacantha*. *Grevillea ilicifolia* is a rather spreading low bush, the flowers very attractive to bees: *Muehlenbeckia adpressa* scrambles up other shrubs; *Kunzea pomifera* ('muntry'), bearing an edible fruit tasting somewhat of apples and making a nice jam, is almost prostrate and extensively rooting. Of the grasses, there are *Stipa elegantissima* with its beautiful feathery awns and two other species at least of Spear Grasses, one with broad leaves (*Stipa* sp.), and probably two species of *Danthonia*, *Agropyrum secalinum* and the introduced grasses *Ehrharta longiflora* and *Pentaschistis airoides*, and Fescues and other introduced species.

The tall *Scirpus nodosus*, with flower stalks like drum-sticks, the small elegant tufted annual *S. antarcticus*, the wiry *Cladium junceum* and the common *Lepidosperma concavum* are scattered representatives of the sedges; the sweet-scented *Dichopogon strictus* (common), *Dianella revoluta*, *Lomandra leucocephala*, *L. glauca* and *Thysanotus* represent the Liliaceae; *Thomasia petalocalyx* is a small showy shrub with almost lilac-coloured flowers; there are two *Hibbertias*, *H. stricta* var. *glabriuscula*, glabrous, with showy yellow flowers and *H. fasciculata* var. *pubigera*, with hoary leaves and rather small flowers, only known

in South Australia from this locality. Other plants comprise *Trichinium alopecuroides* in the Amaranthaceae, with long "pussy-tail" green spikes; a *Pimelea*, and the Rubiaceous undershrub *Opercularia varia* smelling of carbon bisulphide; amongst the composites an abundance of *Millotia tenuifolia*, almost making carpets with its creamy-white flowers, patches of the yellow everlasting *Helichrysum apiculatum*, a few plants of *Senecio lautus* (with showy yellow flowers), the insignificant *S. brachyglossus*, *Calotis erinacea* (yellow flowers), *Podosperma angustifolium* and a single shrub of an *Olearia*, probably *O. axillaris*; a few bushes of *Rhagodia baccata*, *Atriplex Muelleri* and *Enchylaena tomentosa* (Chenopodiaceae); the introduced double-dee *Emex australis* (Polygonaceae) and on the edge of the area towards Alberton the introduced *Galenia secunda* (Aizoaceae), a grey pubescent spreading herb with a resemblance to *Atriplex Muelleri*, hitherto known in this State from Port Germein to Gladstone; *Crassula Sieberiana* and *Didiscus pusillus* were herbs growing on sandy soil which had been burnt; *Wahlenbergia gracilis* had gall modifying many of the flower buds; two introduced Scrophulariaceous plants, *Zaluzianskia dicaricata* and *Dischisma capitatum* were not uncommon, especially the latter; prostrate or spreading plants were represented by a few examples of *Kennedyia prostrata*, *Carpobrotus aequilateralis*, *Calandrinia rotundifolia* and *Astroloba humifusum*; and finally, *Loranthus Exocarpi* grew on *Eucarya acuminata*.

Seaton Golf Links are partly situated on these consolidated sand-dunes and, though just to the east of the area with which we are dealing, the following plants may be noted as occurring there:—*Callitris*, *Cladium junceum*, *Lomandra leucocephala*, *Rhagodia baccata*, *Banksia marginata*, *Grevillea ilicifolia*, *Wahlenbergia gracilis* and *Gnaphalium luteo-album*.

On a sandhill near Fulham grow *Dianella*, *Enchylaena tomentosa*, *Rhagodia baccata*, *Atriplex Muelleri*, *Trichinium alopecuroides*, *C. aequilateralis*, *Kennedyia prostrata* (Scarlet Runner), *Acacia pycnantha*, *A. longifolia* (probably planted), *Dodonaea viscosa*, *Vittadinia triloba* and *Olearia*. *Banksia marginata*, Captain White informs me, grew here at one time.

(6) The Scrub At Hallett's Cove

A generation back, there was an abundant, picturesque, and characteristic scrub on the high land to the south of Hallett's Cove. Much of this was still present in 1920 and later years, but recently most of it has been cleared for cultivation and only remnants remain, chiefly situated along the fences. The original scrub was probably typical of much of that originally covering the undulating country between Aldinga and Marino. Pepper-mints (*Eucalyptus odorata*), She-oaks (*Casuarina stricta*), Teatrees (*Melaleuca pubescens*), Quandongs or Native Peaches (*Exocarpus acuminata*), Native Cherries (*Exocarpus cupressiformis*), Pittosporum *phillyreoides*, Native Privet (*Bursaria spinosa*), and Kangaroo Bush (*Acacia armata*) were amongst the chief trees and shrubs, underneath which grew many shrubs and annuals. Remnants of all of the above have been noted recently as being still present with the exception of the Native Peach—which may possibly linger still in some corner. Other plants still present include two mistletoes, *Loranthus Exocarpi* on *Casuarina stricta* and the *Exocarpus*, and *Loranthus miraculosus* var. *melaleucae* on the *Melaleuca*, the Golden Wattle, *Olearia ramulosa*, *Dodonaea viscosa*, an unidentified shrub not in flower, the scrambling *Muehlenbeckia adpressa* and such annuals and herbaceous plants as *Bulbine bulbosa*, *Dichopogon strictus*, *Chamaescilla corymbosa*, *Goodenia albiflora*, *Trichinium spathulatum* and *Cotula australis*.

(7) The Scrub At Sellick's Beach

There is a large area, probably a square mile in extent, of relatively untouched scrub parallel with Sellick's Beach and extending to the low sandhills skirting the strand. It is quite a surprise to walk from the beach up the slope, covered with low and prostrate undershrubs, pass over the crest of low sandhills and then find oneself in quite dense scrub nestling under the protection of this sandy ridge and extending backwards for about half-a-mile. The larger trees have been mostly cut for firewood, occasional fires have caused havoc and grazing animals have produced some injury. Much of interest still however remains. There are one or two fairly prominent rises. The sandy soil does not lend itself to clearing for grazing, and it would be well that no attempt to do so should be made, as the loose sand would most certainly shift and destroy adjacent useful land. The chief trees, of no great height, of small girth and straggling and

wind-tossed, are Pink Gum (*Eucalyptus fasciculosa*), Pepper-mint (*E. odorata*) and She-oak (*Casuarina stricta*). To the eastward just beyond the sandy soil are a few Red Gums (*E. rostrata*) in better soil probably near water. There is a little grove of *Melaleuca pubescens*. Native Peach or Edible Quandong (*Eucarya acuminata*) still grows here but the small straggly trees do not seem flourishing and there was no evidence of recent fruiting; they were noted growing near both *E. fasciculosa* and *C. stricta* and perhaps these were their hosts. Several Bitter Quandongs (*Eucarya persicaria*) were noted; these were in flower in November and stones were numerous under them. A few Native Cherries (*Exocarpus cupressiformis*) were seen and one *Bursaria spinosa*. The Grass-tree (*Xanthorrhoea semiplana*) is not numerous but flourishes well; leaves were measured half an inch in diameter and the flowering stems were very large and in bloom in October and November. A few stunted *Banksia marginata* still survive. Of taller shrubs, *Myoporum insulare* and *Leucopogon parviflorus* grow behind the coastal ridge, the latter up to ten feet high. Golden Wattle (*Acacia pycnantha*) and Kangaroo Bush (*A. armata*) are present but not abundant. *Thomasia petalocalyx*, *Leptospermum myrsinoides* and *Calythrix tetragona* are abundant. Bracken Fern (*Pteridium aquilinum*) is common near the coastal ridge. In one place is a large nearly pure patch of the handsome *Dampiera lanceolata*, the young shoots nearly white from their woolly investiture. *Grevillea rosmarinifolia* here and elsewhere along the coast has broader and less rigid leaves than, for instance, at Encounter Bay. *Dianella revoluta*, *Muchlenbeckia adpressa*, *Billardiera cymosa* and *Goodenia amplexans* are not common. Rarer are *Correa rubra*, *Isopogon ceratophyllum*, the two species of *Astroloba*, *Hibbertia stricta* and *H. virgata* (spatulate leaves). Of smaller plants, *Burchardia umbellata*, *Wahlenbergia gracilis* with remarkably large flowers and growing luxuriantly, *Dichopogon strictus*, the sedge *Lepidosperma carphoides* and *Erechites* are to be found. *Kunzea pomifera*, with edible fruits, creeps on the ground. Amongst quite small plants are the Carrot-Fern (*Cheilanthes tenuifolia*), the leaves of the orchid *Lycranthus nigricans* (flowering only when the country has been burnt), *Centrolepis strigosa*, *Calandrinia pygmaea* (red leaves, black fruit), *C. volubilis*, *C. calyprata*, *Poranthera microphylla*, *Crassula Sieberiana*, *Didiscus pusillus* and *Millotia tenuifolia*. The grasses comprise more particularly several species of *Stipa* (Spear Grass), *Dichelachne sciurea* and *Neurachne alopecuroides* (?).

The following is a list of plants recognised in this area:—
Pteridium aquilinum, *Cheilanthes tenuisolia*, a slender species of *Stipa*, *S. elatior* (?) (with broad leaves and villous nodes), *Dichelachne sciurea*, *Neurachne alopecuroides* (?), *Cyperus tenellus*, *Scirpus nodosus*, *Cladium juncicum*, *Lepidosperma concavum*, *L. carphoides*, *Centrolepis strigosa*, *Burchardia umbellata*, *Thysanotus Patersonii*, *Dichopogon strictus*, *Xanthorrhoea semiplana*, *Casuarina stricta*, *Isopogon ceratophyllus*, *Eucarya acuminata*, *E. Murrayana*, *Exocarpus cupressiformis*, *Muchlenbeckia adpressa*, *Rhagodia baccata*, *Enchytraea tomentosa*, *Calandrinia pygmaea*, *C. volubilis*, *C. calyprata*, *Clematis microphylla*, *Cassytha pubescens*, *Crassula Siberiana*, *Billardiera cymosa*, *Bursaria spinosa*, *Acacia armata*, *A. spinescens*, *A. ligulata*, *A. pycnantha*, *Correa rubra*, *Poranthera microphylla*, *Stackhousia monogyna*, *Thomasia petalocalyx*, *Hibbertia stricta*, *H. virgata*, *Pimelea* sp., *Leptospermum myrsinoides*, *Kunzea pomifera*, *Melaleuca pubescens*, *Eucalyptus odorata*, *E. fasciculosa*, *E. rostrata*, *Calythrix tetragona*, *Halorrhagis heterophylla*, *Didiscus pusillus*, *Astrolooma humifusum*, *A. conostephoides*, *Leucopogon parviflorus*, *L. rufus*, *Lithospermum arvense*, *Myoporum insulare*, *Wahlenbergia gracilis*, *Goodenia amplexans*, *Dampiera lanceolata*, *Erechtites picridioides*, *Gnaphalium japonicum*, *Cassinia spectabilis*, a *Helichrysum*, *Podosperma angustifolium* and *Millotia tenuifolia*—a total of 69 species to which additions could unquestionably be made.

(8) The Cliffs

a. The Cliffs at Marino.

At Marino the front rank of the Mt. Lofty Range peters out as cliffs on the sea-front. These commence at Kingston Park where they are removed somewhat from the sea by low dunes with a depression on their landward side. Immediately south, the low undulations descend by a moderately gentle slope to the strand and a quarter-of-a-mile further south again abrupt cliffs overlook the loose rocks that cover the intertidal area, the cliffs becoming bolder as Hallett's Cove is approached and broken by several small narrow gullies, some short, some stretching back half-a-mile, down which water runs after storms.

These cliffs, as far back as the railway line, which at Marino is 161 feet above the sea and at Hallett's Cove 256 feet, have a varied and interesting natural flora, not yet destroyed entirely by

the hand of man or the inroads of exotic weeds. This flora is met with immediately on leaving the train at Marino or Marino Rocks, and its accessibility makes a description of it advisable.

With the exception of an occasional She-oak (*Casuarina stricta*) still left forlorn in a little gully south of Kingston Park, all the plants are low or small. In October, *Velleya paradoxa*, with its large yellow slit corolla, is, though lowly, conspicuous and abundant; the related smaller *Goodenia pinnatifida* is also common. In the station yard at Marino, as usual probably on a limestone base, is the erect whitish-flowered *Goodenia albiflora*, in habit rather resembling a crucifer. The spreading *Scaevola microcarpa* is also fairly abundant. There are two *Zygophyllums* with their yoked leaves; *Z. Billardieri* is common, especially on some of the cliffs, and has a diffuse or, when opportunity offers, a scrambling habit; the large-leaved *Z. glaucescens* is rather rare, though plants grow beside the railway station. *Pomaderris racemosa* as a low shrub is frequent in places and is usually windswept. There are a few colonies of *Acacia obliqua* and occasional shrubs of *A. armata*, *A. ligulata* and *A. Victoriae* (*A. sentis*). The latter, a prickly shrub, is very widely dispersed in the State though absent from many districts; it occurs for instance near Eureka, in the Far North and in Central Australia. A glaucous *Olearia* is common, especially near the sea. Amongst the shrubs, both on the open cliffs and also near Kingston Park, are a number of small narrow-leaved bushes of the parasitic Native Peach (*Eucarya acuminata*); these are only three or four feet high and the mother-trees must have long disappeared; none show signs of flowering or fruiting; some of these in Kingston Park were growing through *Beyeria Leschenaultii*, an Euphorbiaceous plant very common here on the slopes of the cliffs. Other small shrubs only occasionally seen are *Hakea rugosa*; the Tea-tree *Melaleuca pubescens* (here only two or three feet high); *Dodonaea viscosa* (Kingston Park); and, especially near the sea the rather prickly, glossy leaved Epacrid *Acrotriche patula*. There are a few plants of the showy *Calythrix tetragona*. The yellow-flowered *Pimelea serpyllifolia* is widespread; there are occasional plants of *Stackhousia monogyna* and here and there a colony of *Euphrasia collina* (Schophulariaceae). Amongst small Composites *Podolepis Lessonii* with spreading branches, yellow flowers and stem-clasping leaves at the forks is common; *Leptorrhynchus squamatus*, somewhat like it but with more erect branches, and *Helichrysum apiculatum* much less common. *H. semipapposum*, very like the last named, and *Microseris scapigera* are rare;

Minuria leptophylla with pale bluish flowers grows on the slope at Kingston Park.

In the Chenopodiaceae, *Enchytraea tomentosa* is abundant, *Salsola kali* is common as is *Atriplex Muelleri* (or *A. baccatum*), a diffuse, almost prostrate plant; *Rhagodia nutans* with red fruits occurs usually amongst rocks; the spreading adpressed *Bassia uniflora* is also numerous, especially nearer the sea. *Convolvulus erubescens* spreads out between shrubs. *Comesperma volubile* climbs through undershrubs such as *Beyeria* and exposes its racemes of blue flowers on their summits, and the Native Cranberry (*Astrolobium humifusum*) is adpressed to the ground. *Oxalis corniculata*, *Lavatera plebeja*, *Plantago varia*, *Kennedya prostrata*, a *Eutaxia*, *Lotus australis*, an *Opercularia*, *Wahlenbergia gracilis* and a *Pultenaea* also occur. *Exocarpus aphylla* with leafless striate branches is not uncommon, often growing on cliffs overlooking the sea and then much wind-swept. *Trich. alopecuroides* and *T. nobile*, are both upright, the latter with the broader heads of flowers (about two inches in diameter), and *T. spathulatum* is smaller and spreads loosely on the ground. Amongst the Liliaceae are the sweet-scented purple-flowered *Dichopogon strictus*, colonies of the stiff-leaved *Dianella revoluta*, the yellow-flowered *Bulbine bulbosa* and three species of *Lomandra*, *L. effusa* with leaves with bifid extremities and two smaller species, *L. glauca* and the bright-green-leaved *L. filiformis* (?) The Amaryllid *Calostemma purpureum* flowers in autumn, but the leaves appear in winter and spring. In the sedges, the stiff *Gahnia lanigera* is one of the most abundant plants and there are scattered tufts of *Lepidosperma concavum*. Of orchids, *Microtis porrifolia* occurs here but is uncommon. The commonest grasses apart from introduced species are the Spear-grasses (*Stipa*), of which three species at least occur, one (*S. Drummondii*) with very pubescent leaves, another (*S. elatior*?) with broad dark green leaf-blades and a third with narrow scabrous leaves; two or three species of Wallaby Grass (*Danthonia*) are common, one of which has yellow-green leaves and stems.

As one reaches the edge of the cliffs, and the effect of the salt spray is greater, several additional plants appear. *Atriplex paludosum*, *Nitraria Schoberi*, the almost white foliaged *Calocephalus Brownii* and *Alyxia buxifolia* appear as shrubs on the sides of the cliffs at their bases. *Disphyma australe* spreads over the surface and *Frankenia pauciflora* forms mats a few inches high. Occasional bushes of *Exocarpus aphylla* grow even on the sides of the cliffs. Tufts of *Poa caespitosa* are met

and as small herb-like plants we find in abundance a small composite (*Angianthus strictus*) and in sheltered situations *Galium* and *Apium australe*. Walking along the rocky strand and looking among the debris at the base of the cliffs and at the cliff face itself, one meets with scattered shrubs such as *Myoporum insulare*, the introduced Boxthorn (*Lycium jerochissimum*), *Olearia*, *Exocarpus aphylla*, *Nitraria*, *Atriplex paludosum*, *A. cinereum* (on the strand only), *Enchytraea* and *Kochia oppositifolia*, and undershrubs and small plants such as *Zygophyllum Billardieri*, *Senecio laetus*, *Trichinium nobile*, *Frankenia*, *Disphyma australe*, *Rhagodia nutans*, *Bassia uniflora* and the grass *Poa caespitosa*. On the strand itself grows Sea Kale (*Cakile maritima*) together with the introduced Medics, Sow Thistle and such grasses as *Hordeum* and *Lolium*. The slender introduced Umbellifer *Bupleurum semicompositum* also grows at the base of the cliffs. A clump of *Goodenia amplexans*, a sticky species with a definite and rather unpleasant smell, grows at the cliff base where a small watercourse discharges.

As one approaches Hallett's Cove, *Calythrix tetragona*, *Wesstringia ligida*, *Dampiera rosmarinifolia*, *Helichrysum apiculatum*, *H. leucopsidium* and the grass *Brachypodium distachyrum* appear and patches of the sedge *Schoenus Tepperi* make in places a sward.

On the south side of Hallett's Cove sandy patches approach the cliff edge and here may be found *Bulbine semibarbata*, *Daucus glochidiatus*, *Plantago varia*, *Gnaphalium japonicum* and the grass *Acurachne alopecuroides*. Strange to say, within a few days of the first record for the State of a small grass, *Psilurus aristatus*, resembling *Lepturus* in appearance, it was found also at this spot—Mr. Black had shown me the specimens and asked if I had ever met with it and this enabled it to be recognised in the field.

On the cliffs just north of Port Noarlunga, the introduced prostrate *Frankenia pulverulenta* was found one year in November. *Myoporum parvifolium*, also prostrate, occurs here.

The cliffs to the south of Port Noarlunga show such grasses as *Stipa*, *Danthonia* and *Calamagrostis filiformis* var. *Billardieri*. Other plants noted were *Bassia uniflora*, *Kochia oppositifolia*, *Billardiera*, *Lotus australis*, *Linum marginale*, *Plagianthus microphyllus*, *Leucopogon parviflorus*, *Apium*, *Bupleurum*, *Alyxia*, *Nicotiana suaveolens* and *Myoporum insulare*.

Along the cliffs from Moana to Aldinga, the harsh sedge *Gahnia lanigera*, *Beyeria*, *Pomaderris racemosa*, a *Pimelea* and *Goodenia pinnatifida* are common. Other plants consist of the

grasses *Themeda*, *Stipa elegantissima* and *Poa caespitosa*; the sedges *Lepidosperma concavum* and *Cladium filum*; *Dianella revoluta*, *Lomandra effusa*, *L. juncea* and another *Lomandra*, *Hakea rugosa*, *Rhagodia baccata*, *Atriplex paludosum* (rocky slopes near the sea), *Kochia crassiloba*, *Enchylaena tomentosa*, *Threlkeldia diffusa*, *Trichinium spathulatum*, *Disphyma australe*, *Zygophyllum*, *Nitraria*, *Cassytha glabella*, *Acacia obliqua*, *Eutaxia microphylla*, *Stackhousia*, *Pimelea serpyllifolia*, *Melaleuca pubescens*, *Eucalyptus odorata* (prostrate), *Convolvulus erubescens*, *Daucus*, *Acrotriche patula*, *Plantago varia*, *Pimpernel*, *Opercularia varia*, *Dampiera rosmarinifolia*, *Scaevola microcarpa*, *Velleya paradoxa*, *Olearia*, *Senecio laetus*, *Leptorrhynchus squamatus*, *Podolepis*, *Minuria leptophylla*, *Helichrysum* and *Angianthus*.

b. *The Amphitheatre at Hallett's Cove.*

The plants of the amphitheatre at Hallett's Cove partake of the nature of the cliff flora, but as this is such a striking geological feature they are worthy of enumeration as a help to the young botanist and as representing the plants found in a restricted area. The only tree is an occasional She-oak (*Casuarina stricta*), in hollows near the watercourses. On the sides of some of the runnels, a large form of *Nicotiana suaveolens* is often abundant—it grows to four feet high, has very large broad leaves which are stem-clasping and up to 9 inches high and $5\frac{1}{2}$ inches broad, and has flowers which are faintly sweet by day and strongly so at night. Shrubs comprise occasional *Myoporum insulare*, *Olearia* probably *O. ramulosa*, *Beyeria Leschenaultii*, *Acrotriche patula* (common), *Pomaderris racemosa* (common), *Enchylaena tomentosa*, *Calythrix tetragona*, the viscid *Goodenia amplexans* and the prostrate, diffusely rooting Muntry (*Kunzea pomifera*). Smaller plants consist of *Zygophyllum Billardieri*, *Eutaxia microphylla*, *Velleya paradoxa*, the small *Goodenia pusilliflora*, *Scaevola linearis* var. *confertifolia*, the deep purple-flowered *Dampiera rosmarinifolia*, *Senecio laetus*, *Helichrysum apiculatum*, *Millotia tenuifolia*, *Bassia uniflora* (prostrate), *Solanum nigrum*, *Halorrhagis teucrioides*, the prostrate *Trichinium spathulatum* and the Liliaceous plants *Dianella revoluta* and *Lomandra effusa*. The pea *Glycine* trails through various shrubs. The grasses comprise Spear-grasses (including the showy *Stipa elegantissima* and the hairy *S. Drummondii*), *Danthonia* and *Poa caespitosa*. The harsh *Gahnia lanigera* is abundant and other sedges include tufts of *Lepidosperma concavum* and the annual *Schoenus apogon*.

(9) Fields and Grasslands

The cleared and often cultivated land on the plains and on the undulating country between the South Road and the Sea.

From Marino to Sellick's Hill, between the cliffs and the Main Road, the original scrub has been almost completely cleared and replaced by grass land and cultivated paddocks. Here and there are remnants of the original flora, as for instance near the school south of Morphett Vale and again between Noarlunga and Aldinga. In the latter, a few Pepper-mints (*Eucalyptus odorata*) are still standing. A few remnants also survive on the sides of the various roads. The chief plants consequently consist of introduced grasses and the weeds of cultivation and comprise many of those with an asterisk against them (indicating that they are introduced) in the list of the plants of the district. Along the edges of the fields and by the sides of roads near Aldinga the following, mostly native, plants were noted:—Several species of Spear-Grasses (*Stipa*) and Wallaby Grasses (*Dactyloctenium*). She-oak, *Enchylaena tomentosa*, *Acacia armata*, *Kennedyia prostrata*, *Oxalis corniculata*, *Eucalyptus odorata*, *Melaleuca pubescens*, *Oenothera odorata* (Evening Primrose, introduced), *Convolvulus erubescens*, *Salvia Verbenaca* (introduced) *Scaevola microcarpa*, *Goodenia albiflora*, *Littadinia triloba*, and *V. tenuissima*. Near Hallett's Cove, the following additional species were seen in grass land:—*Bassia uniflora*, *Pimelea curviflora* and *Galium tricornis* (introduced).

(10) The Banks Of The Several Freshwater Creeks That Empty Themselves Into The Sea

Under Section 4, dealing with the Reedbeds, a short description is given of the plants that may be found on the banks of the Torrens just before it passes into the Reedbeds. Within the area concerned with this survey, the Sturt River passes into the Patawalonga Creek; the waters are saltish and tide-influenced and so do not concern us here. The same applies to the Onkaparinga from Noarlunga to the sea. Small fresh-water creeks, dry, or nearly so, in summer, are represented by the Field River at Hallett's Cove, Pedlar's Creek representing the exit of the Morphett Vale Creek and the small watercourse at Moana where the McLaren Vale Creek emerges. The vegetation of the banks of these creeks has been profoundly altered by grazing and cultivation so that few native species of plants are now to be found there. The few observed include the Bulrush (*Typha angustifolia*, *Triglochin procera*, the Common Reed (*Phragmites communis*), the sedge *Scirpus maritimus* and the rush *Juncus maritimus* var. *australiensis*.

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Bookings for the Special Excursions (marked with a star on the Programme) should be made with Mr. B. Cotton, the Museum, North Terrace, or with Mr. R. C. Shinkfield, Weather Bureau, West Terrace, Adelaide. In the case of Motor Trips, ticket is to be paid for at time of booking.

EXCURSIONS.

September 9—Morialta. Tram, 2 p.m. Leader, Prof. J. B. Cleland, Botanical Survey.

September 16—Blackwood, Train, 2.14 p.m. Leader, Mr. Goldsack, Orchids.

* September 23—Teatree Gully, Motor, 2 p.m. Leader, Mr. Wm. Ham, Physiography.

September 30—Waterfall Gully. Tram, 2 p.m. Leader, Mr. J. G. Wood, Botanical Survey.

October 7—Blackwood (Mr. Ashby's), Train, 2 p.m. Leader, Chairman. Cultivated Flora.

* October 11—Kersbrook, Motor, 9 a.m. Leader, Mr. Wm. Ham, General.

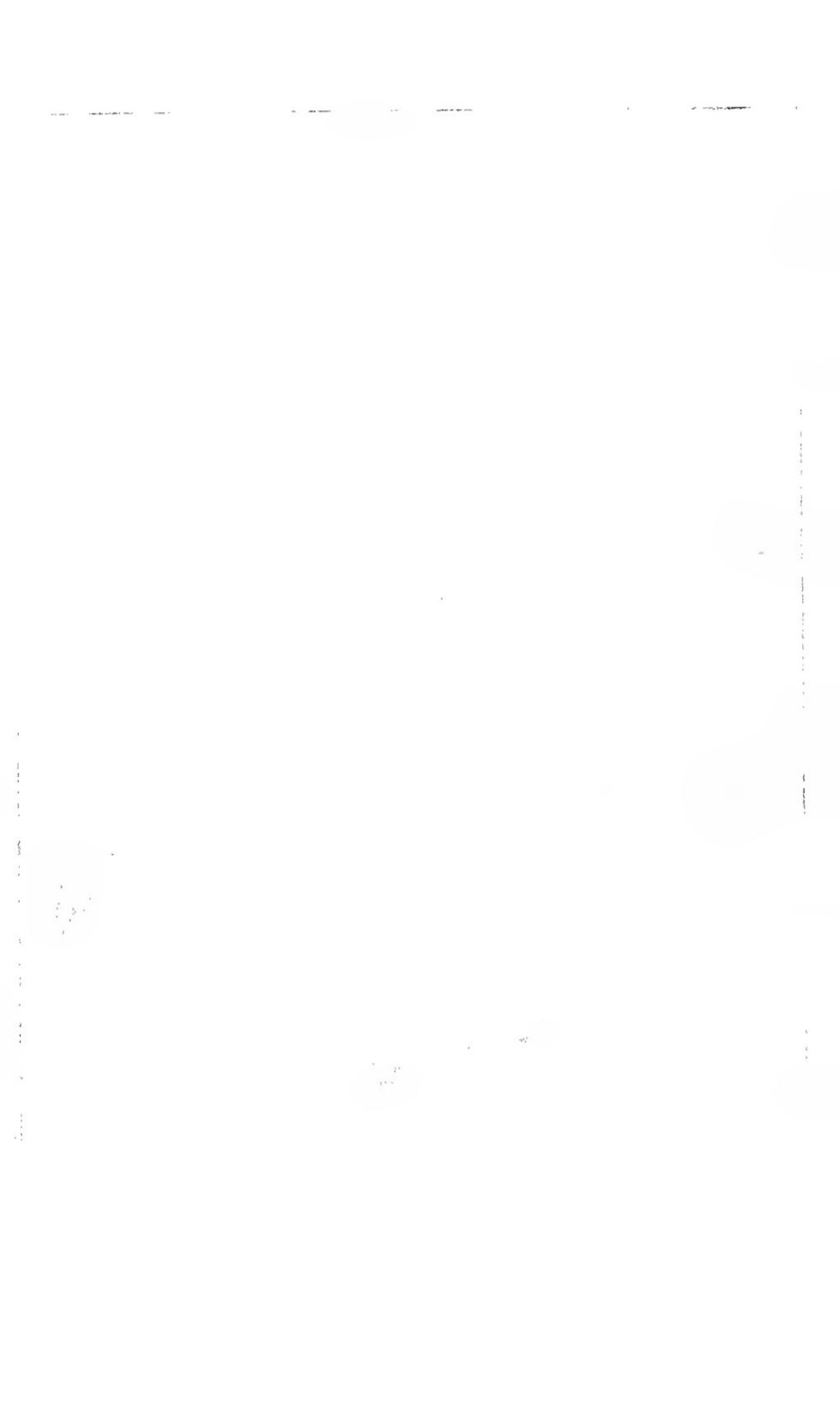
October 13-14—Adelaide Town Hall, Wild Flower Show.

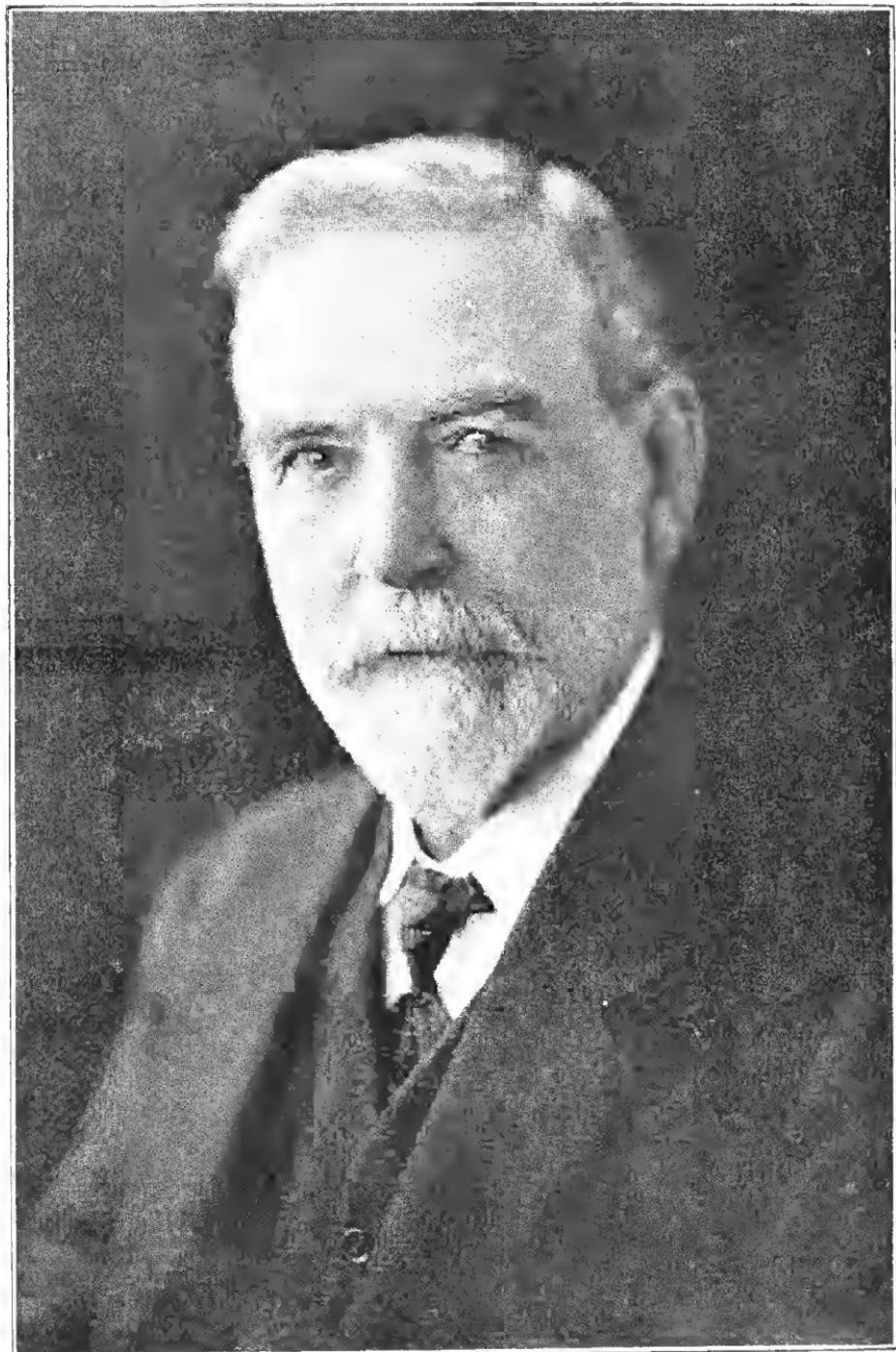
October 28—National Park, Belair. Train, 1.15 p.m. Leader, Mr. E. H. Ising, Botany.

EVENING MEETINGS.

September 19th—"Botany Plants of Far North." Mr. E. H. Ising.

October 16th—"Review of Show." Chairman.





THE LATE SIR JOSEPH COOKE VERCO.

The South Australian Naturalist.

VOL. XIV. ADELAIDE, AUGUST 31st, 1933.

No. 4.

OBITUARY AND BIBLIOGRAPHY OF CONCHOLOGICAL WORKS of Sir Joseph Cooke Verco.

(By BERNARD C. COTTON, *Conchologist, S. Australian Museum*)

On July 29th, 1933, Sir Joseph Cooke Verco passed away after a prolonged illness. His death removes from our midst at once a brilliant medical man and eminent conchologist. Sir Joseph Verco was born at Fullarton in 1851, received his early education in Adelaide, and after matriculating, went to London in 1871. In 1876, after a very successful University career, he obtained the degree M.D. London. He returned to Adelaide in 1878 and soon became the leading man in his profession. His Conchological career was no less brilliant.

The study of Shells commenced very early in life, for as a boy, he had his own miniature museum and made the collection of natural history specimens his chief recreation. Between the years 1890 and 1911 he dredged for shells at various places between Beachport, South Australia, and Fremantle, Western Australia, to a depth of 300 fathoms, and spared neither energy nor money in his efforts to acquire the first and only really scientific collection of shells ever taken in South Australia. Having succeeded, he spent most of his spare time sorting and describing them with characteristic accuracy and thoroughness. From 1895 to 1931 he published twenty-six scientific papers on Mollusca, describing one hundred and thirty-six new species and twenty-six new varieties of shells from South and Western Australia. Most of his papers were published in the Transactions of the Royal Society of South Australia, of which Society he was President from 1903 to 1921.

From 1914 until the time of his death he was Honorary Curator of Mollusca at the South Australian Museum. After donating his own extensive collection and conchological library to that institution, he purchased the May collection of Tasmania.

shells, and the Mathews collection of Australian shells, and gave them also. He later helped to purchase twenty-eight steel cabinets to contain the mass of material so generously given.

The book on Shells, appearing in parts in this publication, was financed principally by him.

Gentle, religious, considerate, Sir Joseph Verco will ever be remembered by all who came in contact with him, and his death will be deeply mourned.

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REVIEWS.

THE INSECT BOOK, by W. W. Frogatt (Australian Nature Books, No. 1. Shakespeare Head Press, Ltd., Sydney, 2/-).

It is unfortunate that the first of a series of books intended for the education of the young should not be thoroughly up to date in its facts and names. Considering the scientific text-books now available there is no reason why this little book should not have been more worthy of the editor's aims.

In the chapter on Wingless Insects, the Lucerne Flea (*Sminthurus viridis*, L.) is incorrectly referred to as *Sminthurinus violacea* and illustrated by a figure of *Sminthurides violacea*.

The classification used is thoroughly behind the times. Earwigs are now recognised as forming a separate order and should not be included with the Orthoptera. The book-lice (*Copeognatha*) and web-spinners (*Embiaria*) do not belong to the Termites or Isoptera.

Vernacular names are always the bugbear of scientists and many in this book are used very loosely, as the name Black-fly for Thrips. Some of these insects are black but the majority and the most important economic species are anything but black.

H.W.

WHAT BUTTERFLY IS THAT? by G. A. Waterhouse, D.Sc. Angus & Robertson 12/6.

This is a very fine introduction to the study of the Butterflies of Australia. Dr. Waterhouse must be congratulated on making it interesting to the beginner and yet keeping it thoroughly scientific. Such treatment of his subject must tend to give the beginner or mere collector an intelligent and stimulating interest in the scientific study of Lepidoptera. The plates are all that could be desired. May it not be long before we have similar volumes dealing with the different groups of moths.

Could not the title of this excellent series of books have been grammatical?

H.W.

EUCALYPTS IN THE BLUE MOUNTAINS, N.S.W. *By A. D. Service.*

A short visit to the Blue Mountains in February this year offered an opportunity to make a survey which is summarised in these notes. Though necessarily incomplete in respect to the whole mountain area, it may be regarded as a representative cross-section of the Eucalyptus flora of the Eastern Slopes. The total distance of the route taken between Blaxland and Mt. Victoria is about 40 miles, and the range in altitude 750 to 3500 feet.

The general formation of the mountains is a raised plateau, made up of nearly horizontal beds of the Hawkesbury Sandstone (of the Triassic System), in which the streams have cut deep canyons with almost perpendicular sides. In these deep gorges, several genera of the temperate rain-forest type abound.

Of the twenty species of *Eucalyptus* enumerated below, only one (*E. viminalis*, Labill.) is commonly found in South Australia, and one other (*E. goniocalyx*, Labill.) is doubtfully recorded from this State.

E. piperita, Sm., "Sydney Peppermint," which was flowering, and *E. Sieberiana*, F.vM., "Silvertop," were the most abundant species. Superficially they bear a marked resemblance, both having clean limbs and rough bark on the trunk, but that of *E. Sieberiana* is generally harder and darker. Another Peppermint, *E. radiata*, Sieb., has a wide range and is particularly graceful. It is rarely large, but the compact nature of its narrow drooping foliage makes it conspicuous and ornamental.

The true gums were represented by seven species, but they constitute a comparatively small proportion of the forest. *E. goniocalyx*, Labill., "Mountain Gum," and *E. altior*, Deane and Maiden, were found only above the 2,500 ft. level, and were usually associated. Both grow to tall trees with clean symmetrical trunks, and stand out boldly against the surrounding vegetation. *E. punctata*, DC., "Grey Gum," with large ochre-coloured patches where the outer bark had fallen away, and *E. Deanei*, Maiden, "Silky Gum," grow only on the lower slopes. The latter, which was noted in only one locality, is a tall, handsome, umbrageous tree with very smooth bluish-grey bark and short, broad leaves, which have been aptly compared with those of a pear tree. The two "Brittle Gums," *E. micrantha*, DC., and *E. maculosa*, Baker, were well distributed and are usually stunted and straggling in habit. *E. viminalis*, Labill., was scarce and often depauperate, generally multiflowered.

The most plentiful of the Stringybarks was *E. eugenoides*, Sieb., stunted as a rule, and with narrower leaves than when growing under more favorable conditions.....*E. ligustrina*, DC., "Dwarf Stringybark," is very similar, but it never grows larger than a small shrub. *E. Blaxlandii*, Maiden and Cambage (which is almost identical with *E. Baxteri*, Maiden and Blakely, well known in the Mt. Lofty Range), is usually of moderate height but some large trees were seen near the Mt. Victoria township. *E. notabilis*, Maiden, was plentiful in its restricted range and was flowering freely, the rather large blossoms making a picturesque contrast with the dark green of the leaves.

There were only two Bloodwoods; *E. corymbosa*, Sm., usually rather straggly, and *E. eximia*, Schau., "Yellow Bloodwood." This was a conspicuous tree, rarely large, with long, falcate, coriaceous, glaucous leaves and flaky bark of a dingy yellow colour.

The three final species grow as small Shrubs. *E. stricta*, Sieb., "Dwarf Gum," was very abundant above 2,500 feet, often forming thickets. Usually about 5 feet high, in one or two instances it was noted as a small tree. *E. Moorei*, Maiden and Cambage, was only found on the plateau. Its small leaves and clusters of tiny sharply-pointed reddish buds give it a very dainty appearance. *E. Baeuerleni*, F.vM., grows near the base of the cliffs along the National Pass; it has leaves of a fresh green colour and distinctive buds and fruits.

SPECIFIC LOCALITIES.

BLAXLAND (768 ft.) to VALLEY HEIGHTS (1065 ft.), 4 miles. *E. eximia*, *E. notabilis*, *E. corymbosa*, *E. eugenoides*, *E. punctata*, *E. piperita*, *E. penrithensis*.

VALLEY HEIGHTS to FAULCONBRIDGE (1465 ft.), 4 miles. *E. notabilis*, *E. corymbosa*, *E. Deanei*, *E. eugenoides*, *E. punctata*, *E. Blaxlandii*.

FAULCONBRIDGE to LAWSON (2408 ft.), 8 miles. *E. piperita*, *E. Sieberiana*, *E. corymbosa*, *E. eugenoides*, *E. micrantha*.

LAWSON to WENTWORTH FALLS (2844 ft.), 4 miles. *E. Sieberiana*, *E. piperita*, *E. corymbosa*, *E. eugenoides*, *E. radiata*, *E. stricta*, *E. ligustrina*.

WENTWORTH FALLS to LEURA (3231 ft.), via National Pass, 4 miles. *E. Sieberiana*, *E. piperita*, *E. radiata*, *E. viminalis*, *E. goniocalyx*, *E. altior*, *E. stricta*, *E. eugenoides*, *E. ligustrina*, *E. maculosa*, *E. micrantha*, *E. Baeuerleni*, *E. corymbosa*.

LEURA to KATOOMBA (3336 ft.), via Federal Pass, about 3 miles. *E. piperita*, *E. Sieberiana*, *E. altior*, *E. eugeniooides*, *E. radiata*, *E. goniocalyx*, *E. stricta*, *E. viminalis*, *E. corymbosa*, *E. maculosa*.

KATOOMBA to BLACKHEATH (3495 ft.), 7 miles. *E. radiata*, *E. piperita*, *E. Sieberiana*, *E. stricta*, *E. altior*, *E. viminalis*, *E. goniocalyx*, *E. maculosa*, *E. micrantha*.

BLACKHEATH to MOUNT VICTORIA (3424 ft.), 4 miles. *E. piperita*, *E. radiata*, *E. Sieberiana*, *E. stricta*, *E. Moorei*, *E. maculosa*, *E. micrantha*, *E. Blaxlandii*, *E. altior*, *E. goniocalyx*, *E. viminalis*.

ON THE OCCURRENCE OF THE GENUS.
LORANTHUS
ON KANGAROO ISLAND, S.A.

By E. H. ISING.

There have been no species of Mistletoe (*Loranthus* or *Viscum*) recorded from Kangaroo Island.

From the earliest settlement when Waterhouse collected botanical specimens followed by others, such as Tate, Tepper, Prof. J. B. Cleland, Prof. T. G. B. Osborn, Mr. J. G. Wood, no mistletoe specimens have been recorded from the Island. The "Flora of South Australia" by J. M. Black, Part 2 (1924) and the supplement in Part 4 (1929) does not record species of this genus, nor does Mr. J. G. Wood, whose article, "An Analysis of the Vegetation of Kangaroo Island and the Adjacent Peninsulas," in the Trans. Roy. Soc. S. Aus. Vol. 54 (1930), p.117, record any species of this family.

I have now to place on record the occurrence of a species of *Loranthus miraculosus* Miq. var. *Melaleucae*, Tate, collected by myself in 1922 and found growing on *Melaleuca* which was situated on the edge of a salt lagoon near MacGillivray. This place is about 14 miles from Kingscote in a southerly direction.

No Loranthaceae are recorded from Tasmania.

NOTICE!

As the Society intends to publish a MEMBERSHIP LIST in the S.A. Naturalist, will Members kindly write to the Secretary or Treasurer as soon as possible, giving—

1. Full Name and Address;
2. Date of Election to Society;
3. Branch of Natural History in which they are interested.

THE COAST FROM OUTER HARBOUR TO SELLICKS HILL.

Geology and Physiography.

(By C. FENNER, D.Sc.)

An effort will here be made to give in simple terms an outline of the chief features of the natural history of the coastal strip which runs from Pelican Point, at the northern end of Le Fevre Peninsula, to the cliffs at the base of Sellicks Hill. This covers a distance of 45 miles of coast—a strip of country full of varied and interesting features, physiographic, geological and botanical—most of it within walking distance of railway stations or tram-lines, and all of it easily reached by good roads from Adelaide—though the good field naturalist must always do the best of his travelling on foot.

In order to set out the geology and physiography more clearly, a map of this 45-mile coastal strip has been prepared, and is set out herewith in four sections. In addition, a block diagram showing a section parallel to the cost from West Beach to Myponga is given on a separate page. This block diagram is intended to show the simpler features of the structure and rock types of the area.

The first point that strikes the observer in his traverse from Outer Harbour to Sellicks Hill is a curious rhythm and repetition in the features seen. There are mangrove mud-flats, coastal sand-dunes, low cliffs of soft yellow and brown limestones, and higher cliffs with rocky and shingly beaches.

The hard rocks of these cliffs are very ancient (Pre-cambrian and Cambrian) and are mostly dark-coloured quartizites. A break one mile long occurs in these hard cliffs at Halletts Cove, running from Howchin Gully to the Field River. Then follows another three miles of quite similar hard rock, with remarkable contortions of bedding in places. A mile of sand dunes occurs where the Moiphettvale Creek comes to the sea, followed by cliffs of level-bedded limestones and mudstones, many of them beautifully coloured.

Apart from the sand-dune break at the mouth of the Onkaparinga River, these gently-dipping, easily-eroded limestones continue for five miles until we come to the Moana sand-dunes, small in area, near the mouth of Pedlers Creek. Then follow two miles of cliffs of hard, ancient rock, four miles of the level-bedded limestone cliffs of Blanche Point and Aldinga, then three miles of sand-dunes and sandy beach at Sellicks Beach, a small area of tertiary limestone cliffs, and finally the high, hard cliffs at the base of Sellicks Hill extending to the south beyond Myponga.

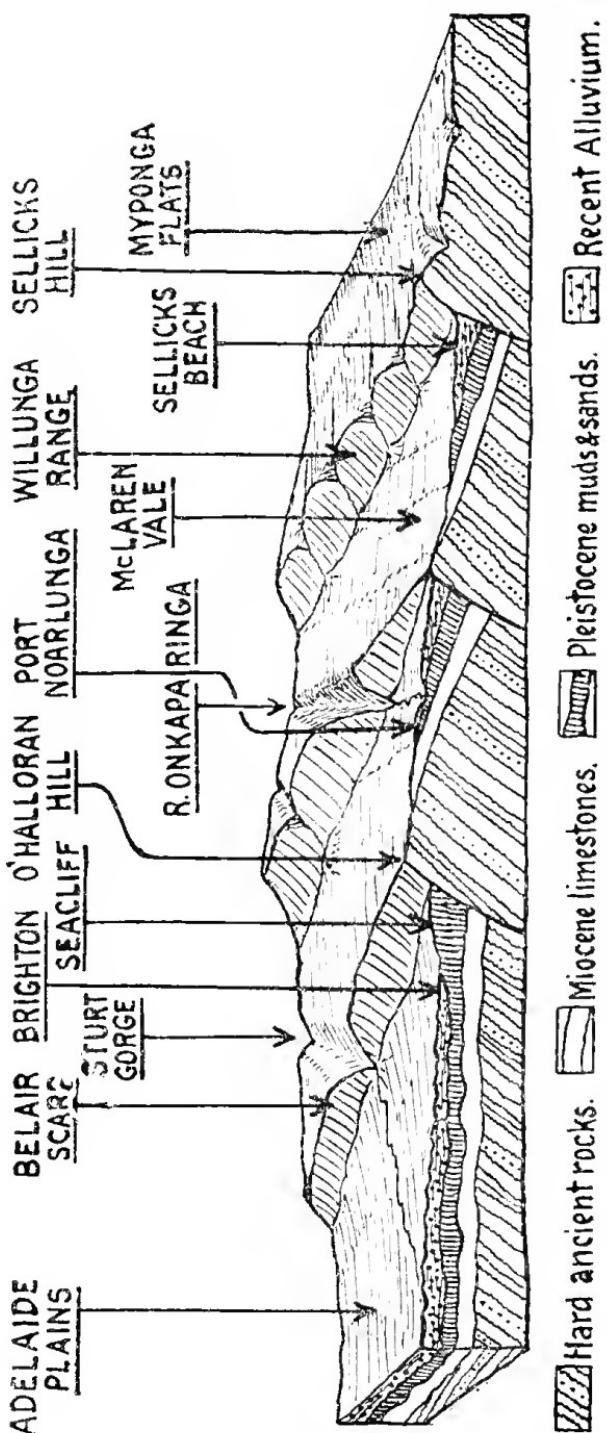


FIGURE 2.—*Block Diagram to illustrate the Structure and Physiography of the coastal strip from West beach to Myponga.*

The reason for the rhythmic arrangement may be seen in the block diagram. Four different kinds of rock are found in this area.—(a) The hard, ancient rock, shown by nearly vertical wavy lines, Cambrian and Pre-Cambrian in age, which forms the ranges, the level uplands, and the more notable of the marine cliffs. In ages long past these ancient rocks were worn down to a level surface by the slow-acting forces of wind and rain and running water. They were then sunken gently beneath the sea, and some hundreds of feet of limestones were formed by the remains of the sea animals deposited upon them.

(b) A gradual rising movement followed and these limestones, laid down on the sea floor, became dry land. Naturally they are rich in fossils. They are shown in the block diagram as horizontal beds without marking and are called Miocene limestones. They form the yellow cliffs of Noarlunga, Aldinga, etc.

(c) Following on this a series of mighty disturbances in the earth's crust took place hereabout, so that huge fractures hundreds of miles long and possibly some miles in depth run through these ancient rocks and their covering limestones. Some of the intermediate blocks of rock were sunken and others were upraised. Erosion took place, and vast deposits of red muds were here and there laid down covering the limestones. Such red muds are still to be seen in the cliffs at Seacliff, Halletts Cove, Noarlunga, and Sellicks Hill. They were formed by fresh water and are mostly red or brown, but sometimes green or yellow, in colour. They are marked in the map by vertical lines and are called Pleistocene muds and sands.

(d) The great faulting and uplifting movements continued and the uplifted or mountain blocks in this area became tilted downwards to the south, as you may see in the two central blocks of the diagram. A good deal of the limestones and mudstones was washed off and carried away, but close to the fracture or fault lines still newer beds of alluvial material were deposited to form wide plains. These are shown in the map as recent alluvium.

We may now see the reason for the rhythmic arrangement above referred to. Where soft muds and sands form the sea beach the sand is washed clean and blown up to form a barrier of sand-dunes. Where the limestones reach the sea, soft cliffs of yellowish or brownish limestones border the coast. Where the ancient hard rocks meet the sea, the latter carves out steep cliffs and shingly beaches with much difficulty, for these old rocks are intensely hard and resistant.

Looking again at the diagram we see first of all the Adelaide Plains with the ancient bedded rock deep below, the Miocene limestones buried out of sight, the Pleistocene muds only coming to the surface at Brighton and Seacliff, the later alluvium and sand-dunes covering the surface.

To the south is the uplifted and tilted block of O'Halloran Hill, crossed in its southern part by the Onkaparinga River, which enters the sea of Port Noarlunga. The Onkaparinga has carved a valley through the hard rocks of the adjoining uplifted block to the south. The third block is equally tilted to the south and east and the over-lying limestones and mudstones increase as we approach Sellicks Hill.

The uplifted scarp face of the Sellicks Hill block forms the Willunga Ranges, and is one of the chief barriers towards communications between Adelaide and the southern districts. It has effectively prevented the passage of a railway, which stops short at its base. The new bituminous road round the seaward base of Sellicks Hill circumvents this powerful barrier in a fairly effective manner.

Perhaps the most interesting correlations that can be made in this strip of country are those between the geology, the land forms, the drainage type and the native vegetation. These relations are very close indeed, and they prove to be very interesting where they have been worked out. Much systematic work remains to be done by the combined effort of the physiographer and the botanist, or better still, by an alert field naturalist who combines a simple but correct knowledge of the geology and land forms with an eye for drainage and with sufficient botanical training to collect his specimens wisely.

A brief note will now be given of the more important physiographic features along the coast.

Mud Flats.—These are in areas where estuarine muds are being brought down from the uplands and where winds and tides have no power to build up sand-dunes. The chief mud flats are near the mouth of the Port River and the Northern Arm, where there are beautiful mangrove-fringed reaches of river backed by ugly mud flats. A second area of mud flats occurs in the tidal portion of the Onkaparinga where mangroves are less common.

Sand Dunes.—The main stretch of sand dunes is that from Outer Harbour to Seacliff. The dunes are here of two types. From a little north of Largs to Seacliff the dunes have been built up in a succession of long ridges, dune and swale, usually three in number, but all the upper part of Le Fevre Peninsula has been built up differently. Here the sand dunes were

lower and were built in sweeping curves as shown in the plan. Le Fevre Peninsula is growing towards the north, following the curve of the Port River as the latter cuts into the narrow extension of Torrens Island, a feature that must some day completely disappear.

The rapid way in which sand dunes and muds will silt up quiet areas has been shown in a remarkable manner in the sea adjoining the artificial projection on which Outer Harbour is built. Sixteen years ago blue water filled both these angles. To-day both the northern and southern bays adjoining Outer Harbour are almost completely silted up, and the differences in the type of silting of the two bays are as interesting as the similarities; these features are left for the reader to investigate.

Older Sand Dunes.—In the long history of the building up of the Adelaide Plains there have been many lines of sand-dunes of which every trace has completely disappeared. But there is one series of ancient dunes of which a large portion still remains and fulfils an important part in the economics of the area. These are the older sand-dunes, mostly reddish in colour. They start east of Somerton, near Glenelg, extend through the Kooyonga golf links, are well preserved near the Torrens, and continue up past Seaton, The Pinery, and Port Adelaide, and form the western part of Torrens Island. They are clearly marked on the accompanying map, and, as shown by Professor Cleland, their flora is quite distinct from that of the surrounding plains, as well as from that of the present coastal sand-dunes.

Cliffs of Softer Rocks.—The first series of limestones and mudstones occurs at Halletts Cove, where they appear to have been let down by faulting. With these is preserved a small patch of very interesting glacial rocks of Permo-carboniferous age. These glacial rocks overlie and protect a great sheet of ice-planed rock surface; the best known exposed area is that known as Tate's Rock, commemorating the place where Professor Ralph Tate made some early investigations regarding this ancient glacial period. This area has also been much worked on by Professor Howchin and Sir Edgeworth David, and has been visited by practically every geologist who has come to the state of South Australia.

The "Amphitheatre" at Halletts Cove is a remarkable example of erosion by running water in soft, level-bedded limestones and mudstones. The sand-dunes and the limestone and mudstone cliffs at Port Noarlunga have all the characteristics of those already described. The same is true of the sand-dunes of Moana, Port Willunga and Sellicks Beach, and of the limestone cliffs of

Aldinga and Sellicks Beach. There are in addition curious differences from place to place, which are not here mentioned in detail but are left for the reader to investigate. The limestone cliffs contain a wealth of fossils, and have been a happy hunting ground for collectors for the past seventy years.

Cliffs of Harder Rocks.—The hard cliff buttresses, where the ancient rocks resist the attacks of the sea, are characteristic of the area from Marino to Halletts Cove, from the Field River to Morphettvale Creek, from Pedlers Creek for two miles south, and from Sellicks Hill southward.

These rocks consist mainly of purple to gray quartzites; usually these have an almost vertical dip, but there are places where there is evidence of the great earth forces that have crumpled them into complex folds. In other places, as at the base of Sellicks Hill, thick beds of limestone are found. Sir Edgeworth David has published accounts of some very primitive fossils from these rocks at Reynella, while in the Sellicks Hill limestones, near the top of the ridge, specimens of ancient "sponge-corals," the *Archaeocyathinae* (ancient cups) may be found.

Drainage and Soils.—Along the coast all varieties of erosion may be studied: marine, aeolian, pluvial and glacial. Similarly there are examples of the most varied types of drainage, from sodden mud-flats, through porous limestones and dunes, to high and well-drained hillslopes. All these points are of importance to the field naturalist, for your true naturalist is not a mere collector, nor a mere observer; he must strive to seek relations between things, and to discover causes. A plant's chief interest may lie, not so much in itself, as in its position on a slope, the accompanying plants, the underlying rocks and soils, the type of drainage and erosion.

The whole of the area, apart from cliff faces, is covered with a widespread mantle of rock waste. Upon this mantle the effects of wind, rain, and sun for some tens of thousands of years has produced the features we call soils. There is quite a variety of soil types within this area, with their different colours and profiles, depending in part on the rock-type below, but much more upon the slope and drainage of the locality. Each soil type has its appropriate plant suite; and each native plant community has certain introduced plants that most commonly displace them or take possession when the native growth is destroyed. Nor should we forget the more elusive native animals, including the birds, the shells, and the beach life, that also take their selected and appropriate place in the scheme of things. Lucky indeed are the field naturalists who have at their doors an area of such rich and varied interest.

ROYAL SOCIETY OF S.A. INCORPORATED — FIELD NATURALISTS' SECTION.

Statement of Receipts and Expenditure for year ended July 31st, 1933.

	RECEIPTS.	EXPENDITURE.
	July 31, 1933.	
To Bank Balance	31/8/32	15 14 0
" Cash in hand at 31/8/32	.. .	5 11
" Subscriptions	37 2 6
.. . Other Receipts—
Donations for Magazine .. .	35 8 5	By Printing and Engraving .. .
Sale of Books by Professors	Postages, etc. .. .
Cleland and Howchin .. .	2 4	Public Library .. .
Sale of Magazines .. .	3 9	Libraries and Stationery .. .
Balance Wild Flower Show .. .	40 11 9	Advertising .. .
Refund of the advance for boat	.. .	Hire of Rooms .. .
trip	Excursion Expenses .. .
S.A. Aquarium Society .. .	6 0 0	Advance for boat trip .. .
Interest .. .	2 2 0	Y.M.C.A. Lantern .. .
Interest .. .	14 11	Conversazione Expenses .. .
	85 3 2	Wreath .. .
	£138 5 7	.. .
		5 6
		110 13 11
		27 3 6
		8 2
		£138 5 7

(Sgd.) BERNARD C. COTTON, Hon. Treasurer. Audited and found correct,

ADELAIDE, 1st August, 1933.

(Sgd.) WALTER D. REED, F.C.A. (Aust.)

(Sgd.) WILLIAM H. BROADBENT

Auditors.

SOUTH AUSTRALIAN SHELLS. (Including descriptions of new genera and species)

PART VIII.

(By BERNARD C. COTTON & F. K. GODFREY).

SCAPHOPODA.

The name signifies scoop-footed. "Tusk Shells" or "Tooth Shells," from their suggestive shape, are immediately distinguishable from the shells of all other living molluscs, being straight or slightly curved tubes, without a spire. Bilaterally symmetrical molluscs with the shell (and mantle) a long, more or less curved, tapering or fusiform tube, open at both ends, the concave side dorsal; anterior orifice larger, contracted by a muscular thickening of the mantle, and giving egress to the cylindrical head and the long, pointed foot, which is capable of being enlarged and variously modified in shape distally; the smaller (posterior) orifice of the mantle and shell giving exit to the refuse of digestion, respiration and the genital products. Head with terminal mouth surrounded by a rosette of lobes; no eyes; otocysts present; no tentacles, but a close cluster of thread-like, distally enlarged appendages known as captaculae, springs from the base of the snout. Jaw and radula present; liver two-lobed, symmetrical; gut strongly convoluted, the anus opening rather far forward in the mantle cavity, kidney openings near it. Gonad simple, opening through the right nephridium. No gills, respiration being performed by the general integument. Heart rudimentary, with only one chamber, auricles and reno-pericardial ducts wanting. Nervous system with well-developed ganglia, the cerebral, pleural, pedal, visceral and buccal ganglia symmetrical. Marine burrowing molluscs, living partially embedded in sand or mud on the sea bottom, with but, as a rule, the posterior extremity projecting. They feed on the lowest organisms. Sexes distinct. The tubular shell, open at both ends, is characteristic of the group, and occurs nowhere else in the mollusca. Growth takes place at the larger end and on the inside of the tube, and at the same time the shell is absorbed at a slower rate from the smaller end. The slits and notches in this end are therefore formed by absorption, being wholly different in genesis from similar structures of the peristome in Gastropods. In some forms upon the practical cessation of growth and absorption upon the

attainment of maturity, there is a supplementary tube built out from the edge of the anal orifice. The shell contains a very slight organic basis, leaving no appreciable amount when dissolved in acid. It is formed of three distinct layers. The inner layer (*hypostracum*) composed of long prisms, rounded at the angles and tapering at the ends. This layer is thinnest at the aperture, thickest towards the apex. The thick middle layer (*ostracum*) built up of short prisms in bundles lying at right angles with each other. The outer layer (*periostracum*) thin and wholly sculptureless. It covers the sculpture, ribs, etc., of the shell. The radula is short, early rigid and curved, and incapable of being used as a rasping organ as in other molluscs; its function is probably largely as a crushing plate, like the gizzard-plates of *Bullaria*. The formula of teeth is 1. 1. 1. 1. 1. (Pilsbry). The posterior aperture of the shell is emarginated by a ventral sinus, and is furnished interiorly with a dorsal and ventral valve, which are capable of being applied to one another. The Scaphopods seem to form an actual link connecting the bivalves with the univalves. In most points they agree with the bivalves; in only two respects—the shell and the radula—do they agree with the univalves, and even in the matter of the shell they begin life as bivalves, for in the embryo this consists of two plates which later become united to form a tube.

The shelled foraminifera found in the stomach of a Scaphopod are perfect, and the sarcode must be extracted from them by some secretion referable to the gastric juice of the Vertebrata. Eyes are absent as they would be useless to an animal always buried in sand. There are no external organs of generation; but impregnation is effected by the male emitting the spermatozoa, and the female her ova at the same time, in the water. The process may be partly compared to the chance shedding of pollen in the air by dioecious plants. Lacaze-Duthiers closely studied *Dentalium vulgare* (France) and noticed that the spermatozoa lived six hours after performing the act of fecundation. The egg is at first oval, afterwards pear shaped, and ultimately divided into segments like those of an Annelid. In the first stage of development the germ is motionless; in the second stage it is propelled by vibratile cilia, which are set round a large lobe in front, similar to that observable in the larvae of many mollusca, and it swims rapidly; in the third stage it crawls by means of a disc-like foot. In swimming it does not come to the surface of the water, as do the fry of the oyster and other mollusca. The shell is formed during the third period, but is only detected by its iridescent lustre, being exceedingly thin and transparent, a

mere film. This state continues till the fifth and occasionally the sixth day after birth. The embryonic period lasts from thirty-five to forty days. Lacaze-Duthiers observed a current of water passing through the shell from the opening at the smaller end. He discovered *Dentalium* at low water mark, where its presence was betrayed by a small groove in the sand, and he easily procured 200 live specimens at a single low spring tide. They prefer certain spots, especially patches of coarse sand mixed with broken shells and interspersed with *Zostera*. The same observer kept some alive in a flask of sea water with a little sand for more than eighteen months. It is much more active at night, being sensible of light. The foot acts as a piston in expelling at the other end the eggs and seminal fluid, as well as perhaps the faeces and exhausted water. The point of a young shell is pear-shaped, and is broken off when too small to contain the terminal tube or process of the mantle; and this part of the shell is continually rubbed away as the animal increases in size, until at last it becomes truncated, and a short pipe is formed with an oblique slit in front to accommodate the terminal tube. The slit is extended in certain species, although this distinctive character is confined to adult specimens. The inside of the shell is white as porcelain, and brilliant as varnish. The periostracum is slight and easily abraded. The microscopical texture of the shell is scarcely different from that of *Patella*. It is most complicated, being composed in a great measure of prisms, interlacing fibres, and anastomosing canals—not of cellular elements (Jeffreys).

The class *Scaphopoda* includes but two families—the *Dentaliidae* and the *Siphonodentaliidae*. The distinctions between them are based upon (a) differences in the median tooth of the radula, (b) the form of the foot, (c) certain quite definite shell characters.

The *Dentaliidae* has the median tooth of the radula twice as wide as long; a pointed conical foot surrounded by an epipodial process resembling a wingshaped sheath, which is interrupted or slit, like the break in a fold, on one side; a shell with greatest diameter at aperture. The shell is almost always, to some extent, sculptured.

In the *Siphonodentaliidae* the width of the median tooth of the radula is much less than double its length, generally less than its length. The foot lacks any epipodial processes, and is either a slender vermiform organ or is expanded on the end into a symmetrical disk with fluted or indented border. The shell, except in one restricted group, wholly lacks sculptural features, being smooth and glassy in texture, and it is generally contracted at the aperture. (Henderson).

DENTALIIDAE.

Shell tubular, curved, with the greatest diameter at the anterior aperture, and tapering evenly to the posterior aperture. Distribution—All seas, from the littoral to moderate depths. Fossil—Ordovician, but most abundant from the Cretaceous where very large species occur. Animal having the foot conical, with a laterally and dorsally interrupted encircling sheath. Differences between this family and *Siphonodentaliidae* have been outlined under class *Scaphopoda*.

Dentalium Linne 1758. An elongate tube open at both ends, increasing in diameter from apex to aperture, section of maximum diameter being coincident with the peristome; almost straight to strongly curved; usually with longitudinal riblets or engraved lines, especially near the tip; these may vary in number from six to sixty or more; ribs or riblets in the apical portion often increased later by addition of others intercalated between them; sculpture frequently disappears in the anterior portion; sometimes fine transverse lirae occupy the spaces between the ribs or even cross them; or the intercostal surface may present a fine reticulate plan of excessively minute sculptural elements; in some groups there are no sculptural features whatever; embryonic portion of apex very minute and fragile, and nearly always lost in very young specimens; apical section remaining may be round or angular in section; apical opening usually modified by a slit or notch of varying width or depth and variously placed in different groups; or the opening may be simple without notch or slit; shell varies from minute needle-like forms to those of four or five inches in length, in thickness from fragile to heavy and solid; in texture from soft and chalky to hard porcellanous or glassy; in colour from greenish, reddish, or yellowish species to pure white, the latter greatly predominating; the shells may be translucent to opaque, dull lustreless to the most highly polished and glistening surface. Type—*D. elephantinum* Linne (Amboyna)

Animal shaped like its shell, elongate, wrapped in a mantle open at both ends; from larger end a pointed cylindrical foot may be protruded or almost wholly withdrawn; without tentacles or eyes; just back of the mouth is a cluster of thread-like appendages enlarged into spoon-shaped terminals (captaculae)—the exact function of these is not definitely understood, but they are supposed to catch and hold the food, consisting largely of foraminifera and other minute organisms; the liver is two-lobed, the gonad simple; heart of one ventricle; without gills; excretory openings in the forward part of the mantle cavity, but the escape

of faecal and sexual products is through the smaller end of the shell; nervous system consists of symmetrically placed central, pleural, pedal, visceral, and buccal ganglia.

Dentalium has been subdivided into a number of subgenera based chiefly upon apical characters of the shell. The actual value of these apical characters for the purpose of classification, and therefore the value of subgenera chiefly based upon them, is not altogether assured, but in a genus embracing so many species some form of division is useful, even though it be somewhat artificial. Any one character, if relied upon to distinguish the larger groups, answers well enough for a time, but it always seems eventually to invite trouble. The shell characters that may be used better in combination for the larger or the smaller groups are: Type of sculpture, the form of the tip, the degree of curvature, the size and thickness of the shell, the position and form of the apical slit. We present our suggestions of subgeneric locations for Flindersian species.

Dentalium Linne 1758, in the restricted sense, does not occur in South Australia. The nearest approach are the species, *chevereti* Sharp & Pilsbry, *katoowense* Brazier, *robustum* Brazier, *duodecimcostatum* Brazier, *intercalatum* Gould, *bednalli* Pilsbry & Sharp, *decemcostatum* Brazier, *tasmaniensis* Tenison-Woods, *thetidis* Hedley, *octopleuron* Verco, *francisense* Verco, *hemileuron* Verco: for these we propose:—

Paradentalium subgen. nov. with *intercalatum* Gould 1859, as type. White shells with six to fourteen strong ribs at the apex, continuing to the aperture or becoming obsolete, the intervals either smooth, with several striae, or a median riblet; apex small; and orifice simple without terminal pipe, slit, or notch (with very few exceptions where a short slit occurs).

Laevidentalium Fischer 1895 (Subgenus). A long fissure on the convex side in the posterior portion of the shell; surface longitudinally striate. Type—*D. ergasticum* Fischer 1882 (Atlantic). Mainly deep water species, of all temperate and tropical seas, distinguished chiefly by the large size and solidity of the shell with numerous longitudinal riblets; apical slit is a frequent but not invariable feature. *D. zelandicum* Sowerby, belongs here.

Fissidentalium Cossman 1888 (Subgenus). Shell smooth or showing growth lines only; slightly oval or round section; apex simple (as defined by Cossman) or with a shallow broad notch on the convex side (as expanded by Pilsbry & Sharp). Type—*D. incertum* Deshayes 1826, an Eocene fossil of the Paris Basin. The principal subgeneric character is the wholly sculptureless shell which is even smooth on the tip. Here we locate *D. iubricatum* Sowerby.

Eudentalium subgen. nov. Shell small; tube square at and near the apex, angular at the aperture; primary ribs serrate, intervals ribless. Type—*D. quadricostatum* Brazier, a South Australian shell, although also reported from north-east Australia and New Guinea.

Episiphon Pilsbry & Sharp 1897 (Subgenus). Shell very small, slender, rather straight, needle-shaped, slightly tapering, thin, fragile, glossy, smooth, and without longitudinal sculpture; apex with a projecting pipe or is a simple orifice; no slit, rarely a notch. Type—*D. sowerbyi* Gmelin 1834, from the Caribbean Sea. Here we place *D. virgula* Hedley, *D. hyperhemileuron* Verco.

D. intercalatum Gould 1859 (= *D. octogonum* Angas 1878, not Lamarck). "The Intercalated Dentalium." Strongly curved and conspicuously tapering in its earlier half, the latter half nearly straight and less tapering; white, lustreless; at and near the apex, hexagonal in section, the angles rather sharp and a little projecting, intervals nearly flat; not far from apex a secondary riblet arises in each of the two faces on the outer curve, and somewhat later the lateral faces and those on the concave side are similarly divided; the secondary riblets gaining rapidly in strength, and on the latter part of the shell equal to the six primary ribs; apical orifice circular, about half as wide as the truncated apex. Length 19, diam. at aperture 2.25, at apex 0.9 mm. General, and not uncommon, beach and down to 300 fathoms, chiefly in muddy bottoms. Also Western Australia—King George Sound to Geographe Bay. (Type locality—China Seas). Exceedingly variable. Length may reach 37 mm. The amount truncated varies so that a stouter, older shell, may not be so long as another which is evidently younger and has not suffered so much truncation. Curvature varies; since the posterior end is progressively removed, the mature shell appears different from that of the immature, being nearly straight and bluntly truncated instead of well curved and posteriorly acuminate. Usually the ribs become more numerous with age, the increase being effected by intercalation and by rib splitting. Generally in the centre of an interspace a riblet arises, and gradually enlarges until it equals the original ribs. The stage of growth at which intercalation begins varies not only in different shells, but in the several interspaces of the same shell. Besides the secondary riblets, eventually tertiary riblets may arise in their interspaces and further multiply the costations. In any position, two equal riblets, instead of only one, may develop simultaneously in an interspace. Further a groove begins to form a rib, and gradually

grows in depth and width until it divides it into two. This groove may begin on the centre or on any part of the side of the rib. The ribs so formed may subsequently be cut up by other grooves. Sometimes two or three of such furrows may appear on the same rib at the same time and enlarging at an equal rate form three or four subequal riblets. The contour of the ribs may vary greatly, they may be narrow and comparatively high throughout their length, or they may almost fade out and leave the anterior part of the shell nearly smooth. The shape of the ribs may also change; they may have concave interstices so as to resemble a fluted column, then the ribs may widen out and become convex, while their interstices become reduced to narrow, shallow grooves between broad, approximate, rounded ribs. Pilsbry suggests the typical form is hexagonal; usually there are more than six costae. The anal appendical tube usually wanting, even during life; when present it may be two or three millimetres long; it is central, but not always in the axis of the shell; it is probably an outgrowth subsequent to truncation, and not merely a residual inner layer of the shell after the outer portion has been absorbed.

D. duodecimcostatum Brazier 1877. "The Twelve-ribbed Dentalium." Straight, thin, shining, six-sided, white; longitudinal ribs rounded, the base with twelve, and from the centre to the apex six, interstices smooth; apex tapering, entire, with minute perforation; aperture large. Length 22, diam. apex .5, base 2 mm. Gulf St. Vincent. 22 fathoms. (Type locality—Darnley Island, Torres Straits, 30 fathoms, sandy mud). South Australian specimens do not exceed 18 mm. and are probably subspecifically distinct.

D. cheverti Sharp & Pilsbry 1898 (= *D. septemcostatum* Brazier 1877, preocc.). "The Chevert Expedition Dentalium." Slightly arched, white; ribs seven, somewhat sharp, having finer ones between, extending from base to centre, interstices with fine transverse silk-like striae; apex perforated, perforation with a minute notch-like fissure on dorsal margin; aperture circular, entire. Length 14, diam. apex .5, base 1.5 mm. Gulf St. Vincent, 22 fathoms. (Type locality—Evan Bay, Cape York, North Australia, 6 fathoms, sand).

D. katowense Brazier 1877. "The Katow Dentalium." Thin, transparent, slightly arched near the apex; white; ribs seven throughout, fourteen from the centre to the base, those above being most conspicuous; interstices with minute lengthened striae; apex thickened, perforation small, entire; aperture circular. Length 14, diam. apex 1, base 2 mm. Gulf St. Vin-

cent, 15-22 fathoms, greatest length 22.5 mm. (Type locality—Katow, New Guinea, 8 fathoms, sandy mud and coral). Brazier in the definition of his species writes "interstices with minute lengthened striae." If the specimens of *D. intercalatum* Gould, from South Australia are examined under a lens when their larger end is towards the light they will show their transverse accremental striae very plainly, but when they lie with their side toward the light these are quite indistinct, and fine axial striae are visible. The relative validity of these axial and accremental striae varies in different examples. They are seen in our specimens labelled *D. katowense* (Verco).

D. thetidis Hedley 1903. "The Thetis Dentalium." Rather thin, tapering, very little curved; white; longitudinal ribs seven, the whole length, those on concave side stronger and wider apart than the others; each interspace grooved by a dozen fine, even striae, faintly crossed by growth lines; towards the aperture one or two interstitial riblets arise; posterior orifice simple. Length 8, diam. of aperture 1 mm. Dredged—Gulf St. Vincent 6-22 fathoms, Cape Jaffa 130-300 fathoms. (Type locality—63-75 fathoms off Port Kembla N.S.W.). A South Australian specimen measures 20 x 2.25 mm. "In the two fresh specimens from 130 fathoms, close to the posterior end, in the furrow on each side next to the central furrow on the convex surface, are four minute holes in an axial line. These are probably only accidental. They may be bore-holes of predaceous molluscs. Still it is a curious coincidence to find them in two specimens in identically the same position; and the coincidence is more striking since they occur only in these two instances, among several hundred *Dentalium* shells. These are often bored, but generally only in one or two holes and in other parts of the shell. However it would be perilous to construct another species to include these two examples, which in all other respects resemble the rest under this name." Verco (Trans. Roy. Soc. of S.Aus. vol. 35. 1911. p.205).

D. bednalli Pilsbry & Sharp 1898. "Bednall's Dentalium." Shell soiled or Isabella-whitish, moderately curved, the curvature posterior; longitudinal rounded ribs, seven, strong, separated by deeply concave and decidedly wider intervals; passing anteriorly the ribs become lower and wider, and tend to split by the appearance of progressively deepening sulci on their side slopes, so that at the aperture there are about ten very low ribs of unequal prominence, besides some incipient ones; intervals shallow and narrower than the ribs; growth striae fine and rather inconspicuous throughout, no longitudinal striation; aperture subcircular, retaining a slightly hexagonal form, as long as wide; apex rather large, orifice small, oval, longer than wide, with thick walls;

no slit or notch. Length 19, diam. aperture 2.8, apex 1.3 mm. Gulf St. Vincent, 15-22 fathoms. (Type locality—Gulf St. Vincent, South Australia). Many specimens dredged with seven ribs posteriorly and a varying number anteriorly. Probably the *D. octogonum* of Adcock's list, a synonym of *D. octangulatum* Donovan.

D. octopleuron Verco 1911 (not *D. octagonum* Lamarck [Angas, Proc. Zool. Soc., 1878, p.868]). "The Eight-ribbed Dentalium." This shell is like *D. bednalli* Pilsbry & Sharp, except that it has eight ribs at the posterior end instead of seven. In four specimens the eight costae run throughout the shell, which may measure 20 mm. in length. But in all the others riblets arise; it may be in only one or in two, or up to all the intercostal spaces. These riblets may number as many as four in a space; they may equal in size the primary ribs, if they are few, or they may remain small, especially if numerous. (Type locality—Gulf St. Vincent, 15-22 fathoms). Verco dredged 88 in good condition in this locality. This variety is the most common in our shallower waters, and this would be the form found by Angas on Henley Beach and named by him *D. octagonum*.

D. robustum Brazier 1877. "The Robust Dentalium." Nearly straight, thick, dull white; axial ribs nine, rounded, wide apart, narrow toward the apex, interstices flattened, smooth; apex with small perforation, entire; aperture thickened, regular. Length 20, diam. apex .75, base 2.5 mm. Gulf St. Vincent, 15-22 fathoms. (Type locality—Katow, New Guinea, 8 fathoms, sandy mud and coral). Some specimens dredged in Gulf St. Vincent have nine ribs posteriorly and more than nine anteriorly.

D. decemcostatum Brazier 1877. "The Ten-ribbed Dentalium." Tapering, thin, slightly arched, white; axial ribs ten, somewhat sharp, interstices nearly flat; transverse striations fine; apex with a small perforation; basal aperture large, circular. Length 20, diam. apex .5, base 3 mm. Gulf St. Vincent 15-22 fathoms. (Type locality—Katow, New Guinea, 8 fathoms, sandy mud). Some specimens dredged in Gulf St. Vincent have ten ribs posteriorly, and more than ten anteriorly.

D. francisense Verco 1911. Pl. 1, figs. 1 and 1a. "The St. Francis Island Dentalium." Moderately solid, narrow, curved, less anteriorly, translucent white; ribs fourteen, broad, low, round, extending throughout, separated by distinct linear inter-spaces; growth lines microscopic; anterior aperture circular, margins thin, scarcely scalloped; posterior end truncated, aperture small, border thick, shape oval, elongate antero-posteriorly. Length 28, diam. ant. 3.2, post. 1.6 mm. St. Francis Island; Gulf St. Vincent; Cape Borda; 15-55 fathoms. Also Western Aus-

tralia—beach—Bunbury, Rottnest Island; dredged—Hopetoun, Geographe Bay, Fremantle, 6-35 fathoms. (Type locality—15-20 fathoms, Petrel Bay, St. Francis Island, South Australia). This shell varies. A much younger individual than the type measures $13.5 \times 2.4 \times .8$ mm, is much more curved and has a slightly projecting appendical tube. There may be only eleven ribs throughout; or eleven posteriorly, and more anteriorly up to twenty-two from intercalated riblets; there may be twelve ribs throughout and these may be typically broad and round, or rather narrow and flat; there may be thirteen, fifteen, or very rarely eighteen ribs throughout. Verco writes, "I am inclined to think that even this species is but an extreme variant of *D. intercalatum* Gould. It would seem as though the more initial ribs are present at the posterior end, the fewer interstitial ribs arise, which is easily understood; and the more likely they are to be round and broad and encroach on the intercostal spaces. Still one may meet with an occasional specimen starting with eleven ribs which increase up to twenty-four, and are rather narrow; or with one which starts with only a few ribs, seven or nine, and these become broad and rounded."

D. hemileuron Verco 1911. Pl. 1, fig. 2. Long, narrow, rather thick, very slightly curved, mostly at the hinder part; white opaque when dead, translucent when fresh, and glistening; axial ribs ten, valid, narrow, about one fourth the width of their interspaces, less valid and less distant on the convex side, well developed in the posterior half, then becoming quickly obsolete and absent from the anterior third; ribs do not increase in number with age; transverse scratch marks, close, and circles of varying opacity; anterior aperture round; posterior aperture round, but on the convex surface it has a sinus about as deep as wide with convex margins. Length 30, greatest width 2.4, smallest .4 mm. Cape Jaffa; Beachport; 130-300 fathoms. (Type locality—300 fathoms off Cape Jaffa, South Australia). Some examples have nine ribs, some eight, some eleven. There are no axial interstitial riblets as in *D. thetidis* Hedley, nor increase in the number of ribs by splitting or intercalation, as in *D. intercalatum* Gould, and the anterior part is ribless.

D. tasmaniensis Tenison-Woods 1876. "The Tasmanian Dentalium." Solid, slender, slowly increasing, slightly curved, white; axial ribs eight, interstices often subeostate; apex entire. Length 10.5, diam. apex .5 mm. Port Adelaide River. (Type locality—Northwest coast of Tasmania). A gracefully tapering shell, curved slightly, with valid ribs and often smaller ones in the interstices. *D. aratum* Tate and *D. nanum* Hutton, of the South Australian and New Zealand tertiaries relatively, are allied

D. zelandicum Sowerby 1860 (= *D. pacificum* Hutton 1873). "The New Zealand Dentalium." Large, slightly arcuate, rather slowly tapering, with numerous unequal ribs, apex mostly with a slit; white, banded with pale grey and tawny; longitudinal ribs of unequal strength, narrow, scarcely raised, eighteen to twenty at posterior end, thirty to forty-five at anterior extremity, about twenty of which being stronger than the others; ribs crossed by distinct, dense, oblique growth lines; posterior orifice narrow, circular, sometimes with a simple, narrow, ventral fissure about 4 mm. long; aperture oblique, dorsal lip somewhat advancing, circular; peristome thin, sharp. Length 57. diam. 8 mm. Dredged—Cape Jaffa, also Beachport, 110-200 fathoms. (Type locality—New Zealand). The smaller ribs arise by intercalation. The fissure is not always present.

D. lubricatum Sowerby 1860. Pl. I, figs. 4 and 4a. "The Slippery Dentalium." Elongate, lightly curved, polished, subpellucid, white; slightly slit, gradually increasing. Length 36.5, greatest diam. 3.25 mm. Dredged Beachport, Cape Borda, Cape Jaffa, Neptune Islands, 40-150 fathoms. Also Western Australia—Hopetoun, 35 fathoms. (Type locality—off Port Jackson Heads, 45 fathoms, hard sand bottom [Brazier]). With reference to the slit, South Australian examples show that in the very early stage of growth there is no slit, but a central posterior aperture; length of slit may vary from a mere notch to a fissure of 8 mm. The slit is always on the convex or ventral aspect. In some specimens the dorsal part near the posterior end is spotted or blotched with opaque white. Rarely, specimens show the extreme posterior end, which is an elliptical bulb with a very short slightly-contracting round tubular posterior prolongation set somewhat obliquely to the axis of the bulb and directed toward the convex side of the shell. Opaque transverse rings appear in the first 1.5 mm. of the shell.

D. quadricostatum Brazier 1877. "The Four-ribbed Dentalium." Very slightly arched, white; four angled, keel or rib at each angle, rounded, finely serrated, interstices flat, marked with transverse lines; apex perforated, perforation entire; aperture angled. Length 16, diam. base 2 mm. Beachport, 110 fathoms. (Type locality—Princess Charlotte Bay, North-east Australia, 13 fathoms). If this species is laid upon its side it forms a true square; when resting with the arched part of the apex down, it forms four angles, with a serrated rib on each angle.

D. virgula Hedley 1903. Virgula, a little twig, refers to the supplementary tube at the narrow end. Shell small, a little curved, slightly tapering, slender in section, circular, polished,

with minute growth rings at irregular intervals, solid at apex, thin at aperture; milk-white opaque rings alternate with pale-orange translucent ones; supplementary tube a small round pipe eccentric to the direction of the shell and arising in the centre of the apex. Length 10.5, diam. at aperture 1.1, at apex .62 mm; diam. of tube .2 mm. Dredged—Cape Borda, Cape Jaffa, Neptune Islands, Beachport, 60-200 fathoms. (Type locality—Numerous examples were taken in 63-75 fathoms off Port Kembbla N.S.W.). Some South Australian examples have slight annular constrictions at intervals of 3 mm: here the shell is less opaque-white, and the opacity gradually increases anteriorly. The appendix is visible in very early life, when the shell is extremely narrow. When the appendix is absent in the early stages of growth the shell is not unlike juvenile *D. lubricatum* Sowerby, but does not increase so rapidly, and has more marked transverse striations.

D. hyperhemileuron Verco 1911. Pl. 1, figs. 3 and 3a. Long, narrow, very slightly curved, mostly at hinder part, rather thin; white when dead, translucent when fresh, and glistening; axial ribs, twelve, invalid, narrow, no increase in number with age, becoming obsolete early, so as to leave the anterior two-thirds of shell smooth but for very fine accremental scratch lines; interstices nearly flat, slightly concave; anterior orifice round, margin thin and simple; posterior end truncated, with a long narrow diaphanous appendix directed eccentrically dorsally: the growth lines on the appendix form a convexly bordered sinus on the ventral surface about as wide as deep, and a scarcely depressed margin on the dorsal surface. Length 20.5, greatest width 1.8, least .7 mm., length of appendix 2.2, diam. .4 mm. Western Australia—King George Sound, 12-14 fathoms, 200 examples, several alive, (Type locality), also Geographe Bay, Fremantle, 10-15 fathoms. Some individuals with perfect posterior ends run down to a diameter of .3 mm., and are there diaphanous and ribless, and have only growth striae; others more mature and with a posterior end of 1 mm. in diameter, and without an appendix, are here bevelled internally and thinner on the convex side, where there is a shallow triangular notch. The largest example is 30.75 x 2.3 mm. The ribs may vary in number from ten to sixteen in different individuals. The species closely resembles *D. hemileuron* Verco, in the ribless anterior portion and the never increasing ribs of the posterior end, and in their extension to within 2 mm. of the end in very young individuals and in the ventral notch at the hinder extremity; but the latter

has no appendix, the ribs are more valid and do not so soon become obsolete, and it is not found in such shallow water. The absence of the appendix may be only an accidental circumstance, and the shallower water in which the Western Australian species lives may account for the other differences, and that this is only a local variety. One individual from Geographic Bay, measuring $4 \times .5$ mm., has the apical end complete.

SIPHONODENTALIIDAE

(=*Siphonopoda* Sars; = *Gadilinae* Stoliczka; = *Siphonopodidae* Simroth). Shell small and generally smooth, often contracted towards the mouth. Distribution—All seas, from the tidal zone to the abyssal depths. Animal having the foot either expanded distally in a symmetrical disc with crenate continuous edge, with or without a median finger-like projection, or simple and vermiform, without lateral processes. Characteristics which differ from *Dentaliidae* are referred to under class *Scaphopoda*.

Cadulus Philippi 1844. Small, more or less arcuate, generally swollen, or with an inflated bulging area in the middle portion of the shell or near the anterior aperture; white; without any sculpture; aperture more or less contracted and usually very oblique; apical aperture proportionately quite large as compared with that of *Dentalium*, and either simple or cut by two or four slits; section round or flattened; occasionally an internal circular rib is developed just within the apical orifice. Type—*Dentalium ovulum* Philippi (Mediterranean). The genus is represented in all depths. The mollusc lives in sandy and muddy stations and often in great individual quantity. Species not usually very widely distributed but certain exceptions are notable. The idea of variation of individual species is exaggerated by breakage of the ends causing the shortened specimens to appear more inflated. Texture of shells is vitreous and more or less translucent; there may be circular deposits of shelly material, causing alternate rings of more or less translucency which are not, however, specific characters, but appear to be wholly individual and possibly pathologic. The concave side is commonly accepted as dorsal, and the convex ventral. The important specific characters of the Caduli are the slits and lobes about the edge of the apical orifice, the general shape of the shell, the ratio of length to breadth, the localised or general type of swelling, the compression of the shell, the obliquity of the aperture, and, lastly, the size. A good way to identify material is to examine first the apical characters in order to place the shells in their proper subgeneric groups; then seek among figured species of similar size for those with median

or submedian equators (section of maximum diameter), or with equators more anteriorly placed; after which the oval or round section, the small or large apical orifice, and the obliquity of the aperture, follow. Subgenus *Cadulus*, in the restricted sense, includes species which are somewhat cask-shaped, short, obese, conspicuously swollen in the middle, tapering rapidly toward both ends; convex on all sides, though less so dorsally; peristome simple, thin; anal orifice large, with simple edge contracted by a wide circular callus or ledge just within the opening. This subgenus does not appear to be represented in Flindersian waters.

Cadila Gray 1847 (subgenus). Decidedly curved, more or less swollen near the middle or towards the aperture; more tapering toward the apex; apical orifice not contracted by a callous ring, or with such callous ring, weak and far within; edges not slit. Type—*Cadulus gadus* Montague, of uncertain habitat. Species located here are usually small and slender. We include: *C. acuminatus* Tate, *C. angustior* Verco, *C. laevis* Brazier, *C. occiduus* Verco, *C. spretus* Tate & May.

Polyschides Pilsbry & Sharp 1898. (subgenus). Inflated anterior to the middle or not much bulging; apex cut into a number of lobes, generally four, by as many slits. Type—*Cadulus tetraschistus* Watson 1879, from Fernando Noronha. Our species *C. gibbosus* Verco, belongs here. We would remark that the chief characters of this subgenus are the deep slits and prominent apical lobes. Typical quadridentate forms appear numerously in the Eocene.

C. acuminatus Tate 1887. "The Acuminated Cadulus." Rather thin, moderately arcuate, not much swollen, fusiform, the greatest girth about the middle, thence very gradually tapering towards the ends, which are rather large; median bulging being about as obvious in a dorsal or ventral as in a lateral view of the shell; tube somewhat flattened antero-posteriorly throughout, the compression slightly greater at the ends; smooth, glossy, translucent whitish, with an opaque white ring a short distance from the smaller end, produced by a narrow internal callous ledge; both openings oval, their outlines more flattened on the convex than on the other side, and both cut the tube nearly at right angles; peristome simple. Length 6, diameter at middle 1, aperture .75 mm. Diameter of apex about two-thirds that of the aperture. Gulf St. Vincent, not uncommon in shell sand. (Type locality—Oyster beds of the Upper Aldinga series). The specific name is singularly inappropriate. Specimens vary in obesity. The white girdle near the smaller end is constantly conspicuous on the milky translucent colour of the rest of the shell.

This girdle is removed from the apex a distance about equal to the diameter of the latter. There is no thickening of the shell wall toward the aperture, and no appearance of striae under considerable magnification.

C. angustior Verco 1911. Pl. 1, figs. 5, 5a and 5b. "The Narrower Cadulus." Thin, slightly curved, chiefly in the posterior half, cylindrical, very gradually increasing from behind and very slightly narrowed at the front, scarcely compressed laterally; fractured at posterior end at right angles to the curve, and with a small triangular spine, 1 mm. long, projecting backwards from the convex side; anterior end open, sloping obliquely forwards from the convex side; margins simple, smooth; shell smooth, diaphanous; a transverse milky line present or absent near the front and sometimes near the posterior end. Length 4.6, breadth .6 mm., 26 fathoms 18 miles south-east of Newland Head, South Australia (type locality), also Cape Borda 62 fathoms. Also Western Australia—Hopetoun, King George Sound, Geographe Bay, 12-35 fathoms. From *Cadulus acuminatus* Tate, it is narrower and more cylindrical, with less bulging about the middle. Dredged by Verco; with the type were many specimens which appear to show the three progressive stages of growth—first as a *Dentalium*-like shell, which becomes constricted when it reaches a certain age, then begins to form the proper *Cadulus* shell, from which it subsequently breaks off, leaving the tiny projecting spine beyond the line of fracture.

C. laevis Brazier 1877 (*Dentalium*) (not *D. laeve* Schlotheim). Strongly arched, half-moon shaped; light amber, sometimes white, glossy, smooth; basal margin pinched in about four millimetres long, forming somewhat like a shoulder, then slightly varicose, from that to the apex regularly tapering; apex with a minute perforation, entire. Length 28, diam. base at shouder 2, below 1 mm. S.W. of Neptune Islands, 62-104 fathoms. (Type locality—Princess Charlotte Bay, Northeast Australia, 13 fathoms, sandy mud). The lower part of this shell resembles the spines of sea-urchins. The greater part of the specimens are encrusted over with a fine coating of coral-like substance (Brazier). South Australian specimens seem closely related to this species.

C. occiduus Verco 1911. Pl. 1, fig. 7. "The Western Cadulus." Rather solid; ventral curve nearly uniformly slightly convex; dorsal side nearly straight in the anterior fourth, slightly convex in the next quarter, and slightly concave in the hinder half; cut off perpendicularly to the axis behind, rather obliquely in front, where the slope is backward toward the convex side;

both apertures slightly flattened, because of a slight dorso-ventral compression of the tube; white, more opaque anteriorly, and in transverse lines; smooth but for scanty transverse microscopic scratches. Length 9.6, greatest diam. 1.4, anterior diam. 1, posterior .5 mm. St. Francis Island, 10 fathoms. Also Western Australia—Geographe Bay, off Bunbury, 15 fathoms (type locality); also Fremantle 10-12 fathoms, very many. Species variable; mature shells may be only 5 mm. and proportionately narrow, and the inflation on concave side may almost disappear.

C. spretus Tate & May 1900. "The Despised Cadulus." Well curved, of medium proportion; variegated (in some specimens) with translucent and opaque-white rings and encircling bands; smooth, with fine obliquely annular grooves or lines, without traces of vertical striae; aperture circular, transverse; tube suddenly contracted quite near the oval aperture, but exhibits a slight dilation at the end. Length 5.5, diam. apex .3, aperture .7 mm. Cape Borda. Cape Jaffa, Beachport, 55-300 fathoms. (Type locality—Port Esperance, Tasmania, 24 fathoms). *Cadulus teliger* Finlay 1926, is the New Zealand shell which Suter in "Manual of the N.Z. Mollusca" had admitted in error as *C. spretus* Tate & May. At several stations Verco dredged a modified form of *C. spretus*, having at one point in its length a sharp annular constriction, beyond which the shell often has a slightly altered axis, and at times a somewhat different curve; the relative length of the two portions varies, the earlier or the later part may form nearly the whole, or there may be any intermediate proportion.

C. gibbosus Verco 1911. Pl. 1, fig. 6. "The Gibbous Cadulus." Narrow, somewhat fusiform, polished, smooth, slightly compressed dorso-ventrally, smaller behind; greatest diameter at junction of middle and anterior third; dorsal surface obtusely angled at this point; ventral surface almost uniformly convex; anterior end sloping forward from the convex to the concave surface, mouth rather wider than high; posterior end with a slit on each side, one on the convex surface and a wider curve on the concave; milky-white, somewhat obliquely striatedly painted, and a transverse colourless line near the posterior end. Length 9.7, greatest diam. 1.8, posterior end .45, anterior end 1.1 mm. 300 fathoms off Cape Jaffa (type locality).

49th ANNUAL REPORT OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

For Year Ending August 31, 1933.

The work of the Section has been maintained during the last twelve months, and the following report is presented for the information of members.

MEMBERSHIP.—The Section, during the last year, added 35 new members. The total now being 140, most of whom are financial, and 9 Honorary members.

EXCURSIONS.—The Excursions carried out according to the programme have proved both interesting and instructive. The objective of the Section has not been lost sight of by the Leaders and their kindly interest and assistance has been much appreciated by the members.

The attendance at many of the outings was not good considering the number of members on the books.

We have had six Motor trips which were fairly well attended and most enjoyable.

LECTURES.—We have been favoured with an interesting series of Lantern Lectures during the last year. "Cinema of Wild Life," Mr. Laubman; "Introduction to Botony and Plants of Far North," Mr. E. H. Ising; "Shells," Mr. F. K. Godfrey; "An Introduction to Microscopy," Mr. W. H. Harding; "The Main Soil Classifications of S.A." Prof. J. A. Prescott, M.Sc., A.I.C.; "Crabs, Prawns, etc., as Friends and Enemies of Man," Mr. H. M. Hale; "Big Game Hunting in Central Africa," Mr. Fred J. Nottage; "Ayre's Rock, Mt. Olga, and an Introduction to Mammals," Mr. J. H. Finlayson.

PUBLICATIONS.—Our Journal, "The South Australian Naturalist," has been published under the Editorship of Mr. Wm. Ham and Mr. B. Cotton. During the year a number of Sections dealing with the shells of South Australia have been published with extensive illustrations, some of them in colour. These will later be published as a separate volume.

WILD FLOWER SHOW.—The 13th Annual Wild Show was held on October 14th and 15th in the Adelaide Town Hall. The Show was a great success. The exhibits were good and well staged. The balance sheet showed a profit of £40/11/9. The daily and evening attendances were very good, showing that the outside public are taking a greater interest in our work.

HERBARIUM.—The work in the Herbarium has been continued, several meetings have been held, and the arranging and mounting of specimens has been proceeded with. We are pleased to welcome Miss C. Eardley, a new member.

LIBRARY.—A few additions have been made to the Library. The Section will welcome any gifts of useful and suitable books.

FINANCE.—See Balance Sheet in this issue.

SECRETARY.—Mr. Dix, owing to his transfer to Port Adelaide, found that he was unable to continue to act as Secretary to the end of the year. Miss Murray was appointed.

Mr. and Mrs. A. D. Service have been lost to the Section, being transferred to Brisbane. A letter of introduction has been sent to The Field Naturalists' Club, Queensland.

The Section has, with great regret, to record the loss by death, of Miss M. Roeger, a valued member of long standing.

15/8/33.

J. M. MURRAY, Hon. Secretary.

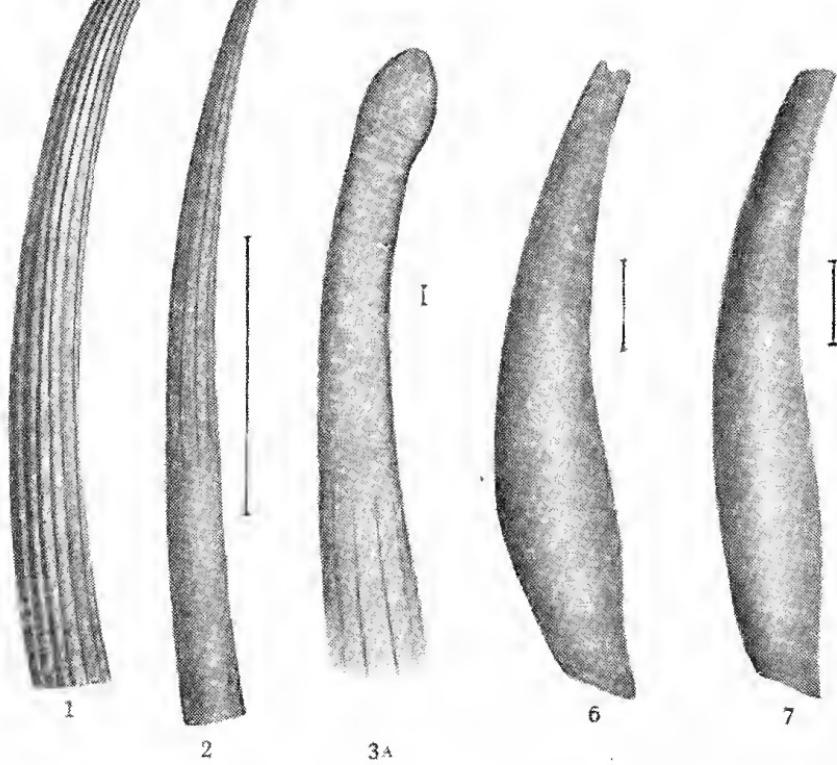
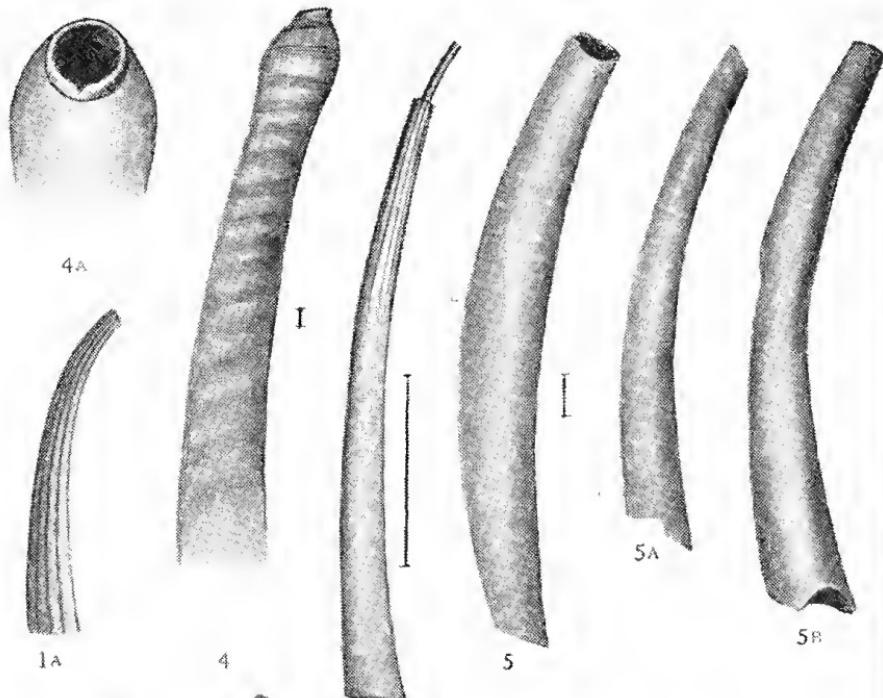
1. "The Victorian Naturalist," May number. A new terrestrial orchid is described, named by its discoverers *Leianthus tenuissimus*. It grows near Perth, in W.A. Our members who study orchids will be interested in an article on the pollination of *Diuris sulphurea* by a native bee.
2. "The Book of the Public Library, Museums, and National Gallery of Victoria." This little volume contains an account of the history of these Institutions from 1906 to 1931.
3. "Papers and Proceedings of the Royal Society of Tasmania for the year 1932."
4. "The S.A. Ornithologist," July number.
5. Linnean Society of N.S.W.—Abstract of Proceedings for May, 1933.
6. "The Victorian Naturalist," June number. "A Beautiful Phalanger" and an article on the Aizoaceae, with coloured illustrations, are two of the chief articles.
7. "Natural History," The Journal of the American Museum of Natural History, August number.

No. 1.—"The National Parks and Forest Reserves of Australia," by Wm. H. Selway, Chairman F.N.S., 1912. (Out of Print).

EXPLANATION OF PLATE

PLATE I.

1. *Dentalium francisense*, Verco.
- 1A. *Dentalium francisense*, Verco, young.
2. *Dentalium hemileuron*, Verco.
3. *Dentalium hyperhemileuron*, Verco.
- 3A. *Dentalium hyperhemileuron*, Verco, early stage.
4. *Dentalium lubricatum*, Sowerby, early stage.
- 4A. *Dentalium lubricatum*, Sowerby, apex.
5. *Cadulus angustior*, Verco.
- 5A. *Cadulus angustior*, Verco, initial stage.
- 5B. *Cadulus angustior*, Verco, medium stage.
6. *Cadulus gibbosus*, Verco.
7. *Cadulus occiduus*, Verco.





**FIELD NATURALISTS' SECTION OF THE
ROYAL SOCIETY**

Publications of the Section.

No. 1.—“The National Parks of Australia,” by Wm. H. Selway. (Out of print).

PUBLICATION NO. 2

GEOLOGICAL AND BOTANICAL NOTES
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